FOUNDRY TRADE JOURNAL

EST. 1902

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JULY 14, 1960
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TECHNOLOGY DEPARTMENT

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Long life in service, accuracy and assured interchangeability make Sterling the foundryman's first choice.

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JACKMAN MELTING EQUIPMENT

CUPOLAS · SPARK ARRESTERS · CHARGERS · LADLES

By courtesy of Messrs. Mather & Platt Ltd., Park Works, Manchester

We show a recent installation of three wet spark and grit arresters supplied to existing cupolas. The middle cupola was blowing when the photograph was taken

ALL SIZES OF HIGHLY EFFICIENT WET AND DRY TYPE SPARK AND GRIT ARRESTERS CAN BE SUPPLIED FOR NEW AND EXISTING INSTALLATIONS

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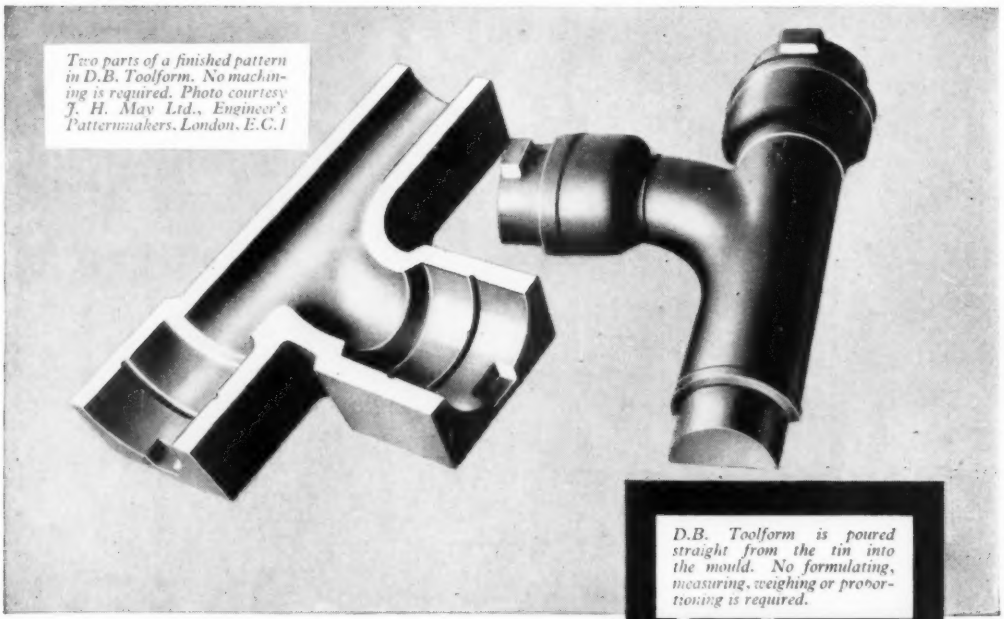

Two parts of a finished pattern in D.B. Toolform. No machining is required. Photo courtesy J. H. May Ltd., Engineer's Patternmakers, London, E.C.1

D.B. Toolform is poured straight from the tin into the mould. No formulating, measuring, weighing or proportioning is required.

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D.B. Toolform simplifies foundry pattern-making and results in a superior job at an economical cost.

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FTJ2

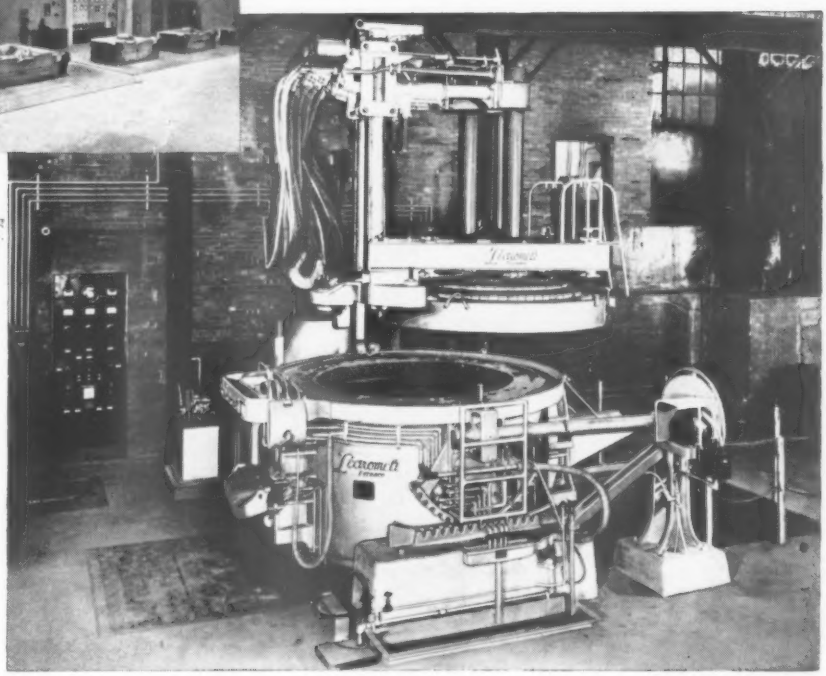
TGA DB3

GWB

DEMAG

Lectromelt

Demag high-frequency induction furnace installation at a steel making plant, incorporating two 1 ton capacity furnaces, two 660 lb. capacity furnaces, and one 110 lb. capacity furnace.



A 3 ton capacity Lectromelt arc furnace of 9' 0" diameter shown with roof swung ready for charging.

High Speed and High Output are the key features in the medium and smaller range of furnaces offered by G.W.B. Furnaces Ltd. Many years of experience are behind both the Coreless and Arc Furnaces of Demag and Lectromelt designs. Daily, electric furnaces are finding wider and wider applications, and the coreless induction (crucible) type is no exception as it is an ideal medium for melting steel and iron, and all other metals. It is particularly advantageous in steel works where a charge of scrap of known analysis is melted and is an installation that pays for itself in a very short time. The proven economies of operation of electric arc furnaces offered by G.W.B. have earned an enviable reputation, and a few of their outstanding features are:—

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GWB 243

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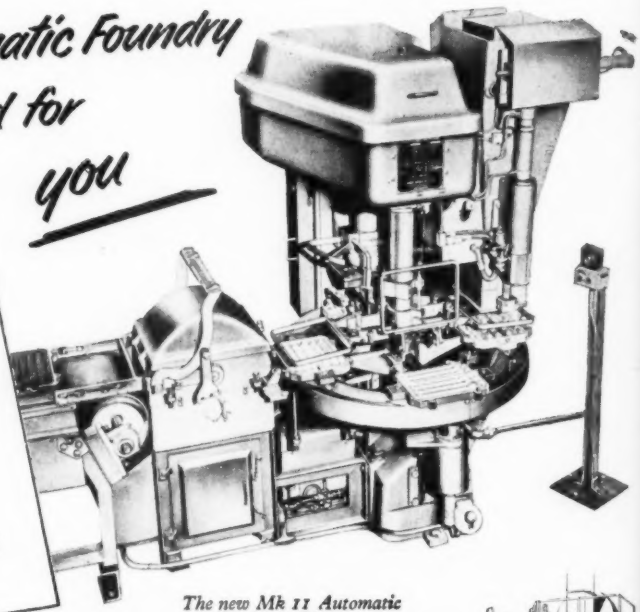
FOUR complete moulds in one minute



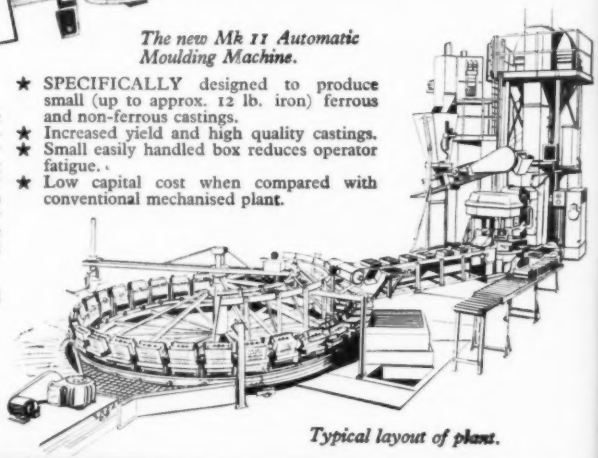
The new Mk 11 Automatic Moulding Machine.

The arrangement of the System is centred on one rotary moulding machine which performs automatically all the moulding operations, finally depositing the complete half mould on to a moving conveyor ready for assembly. From there, the only manual operations required are bringing the two half moulds together, guiding them into the rotary casting conveyor, metal pouring from a fatigue reducing mechanism and removing the mould and castings at the shake-out.

Note these outstanding features:

★ Automatic moulding eliminates all skilled operations and increases production.
★ Automatic sand reconditioning.
★ Automatic mould clamping and releasing.
★ Economy of floor space (the complete plant only requires 60 ft. by 30 ft. approx.).

★ SPECIFICALLY designed to produce small (up to approx. 12 lb. iron) ferrous and non-ferrous castings.
★ Increased yield and high quality castings.
★ Small easily handled box reduces operator fatigue.
★ Low capital cost when compared with conventional mechanised plant.



Typical layout of plant.

It's the HALLSWORTH AUTOMATIC MOULDING SYSTEM

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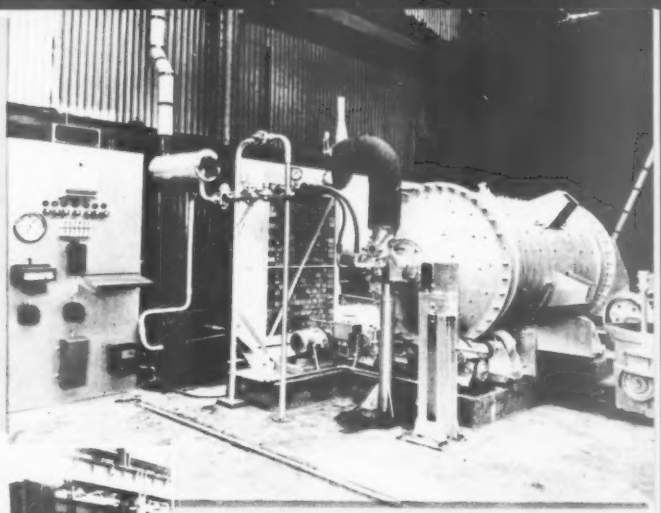
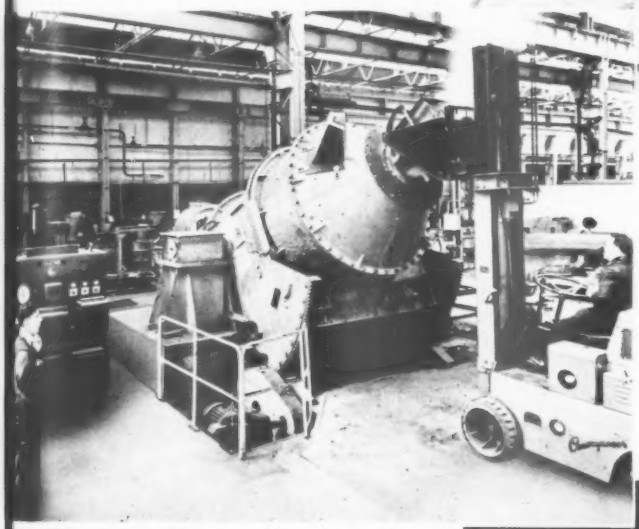
AT LOWEST PRODUCTION COST PER TON





ing Type Rotary furnace reduces time and bour for charging. The furnace may be tilted to ertical position for relining.

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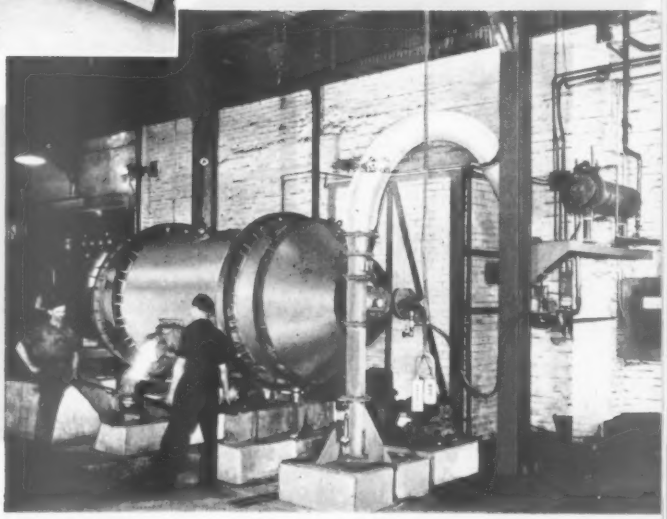

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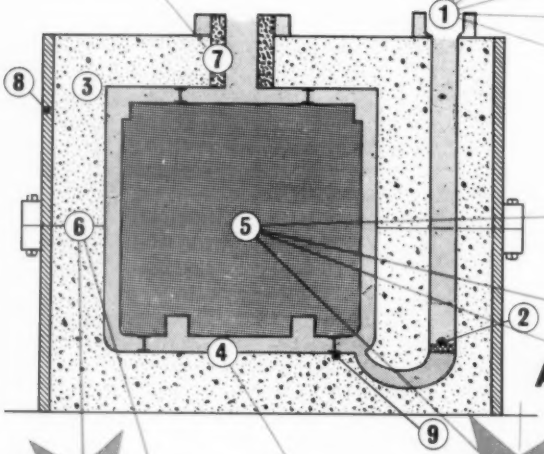

Key to Sectional Drawing of Mould

		Send for booklet No.
1	Metallurgical Control use of Fluxes	3
2	Clean Metal by using Ceramic Strainer Cores and Discs.	4
3	Coal Dust additional to Facing and Backing Sand	1
4	Silverskin Blackings, Plumbago and Mould Dressings.	1
5	Cores using Crulin and Crudol Core Binders (Oil Bonded, Air Setting Cereal or CO.2 Binders).	2
6	Moulds Parted with Beecro Silica Free Parting Powder or Beecrol Parting Liquid.	1
7	Casting Feeding with Alsica Exothermic Feeder Heads.	4
8	Moulding Boxes supplied by B.F.U. }	5
9	Chaplets, Studs, etc. }	

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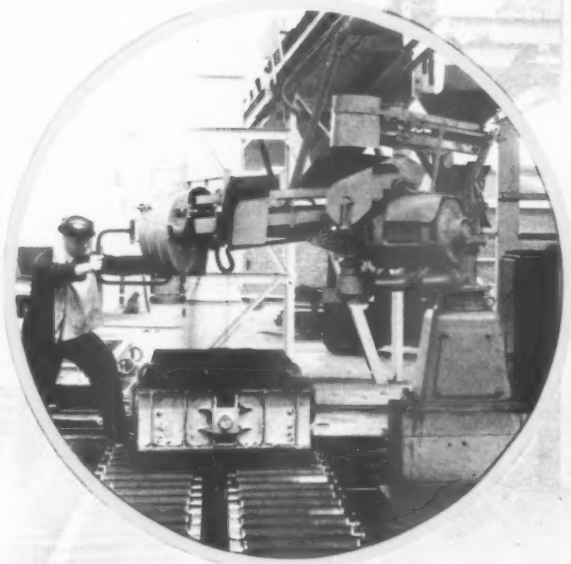

For details of this and other types of SANDSLINGERS Send for Illustrated Brochure S57

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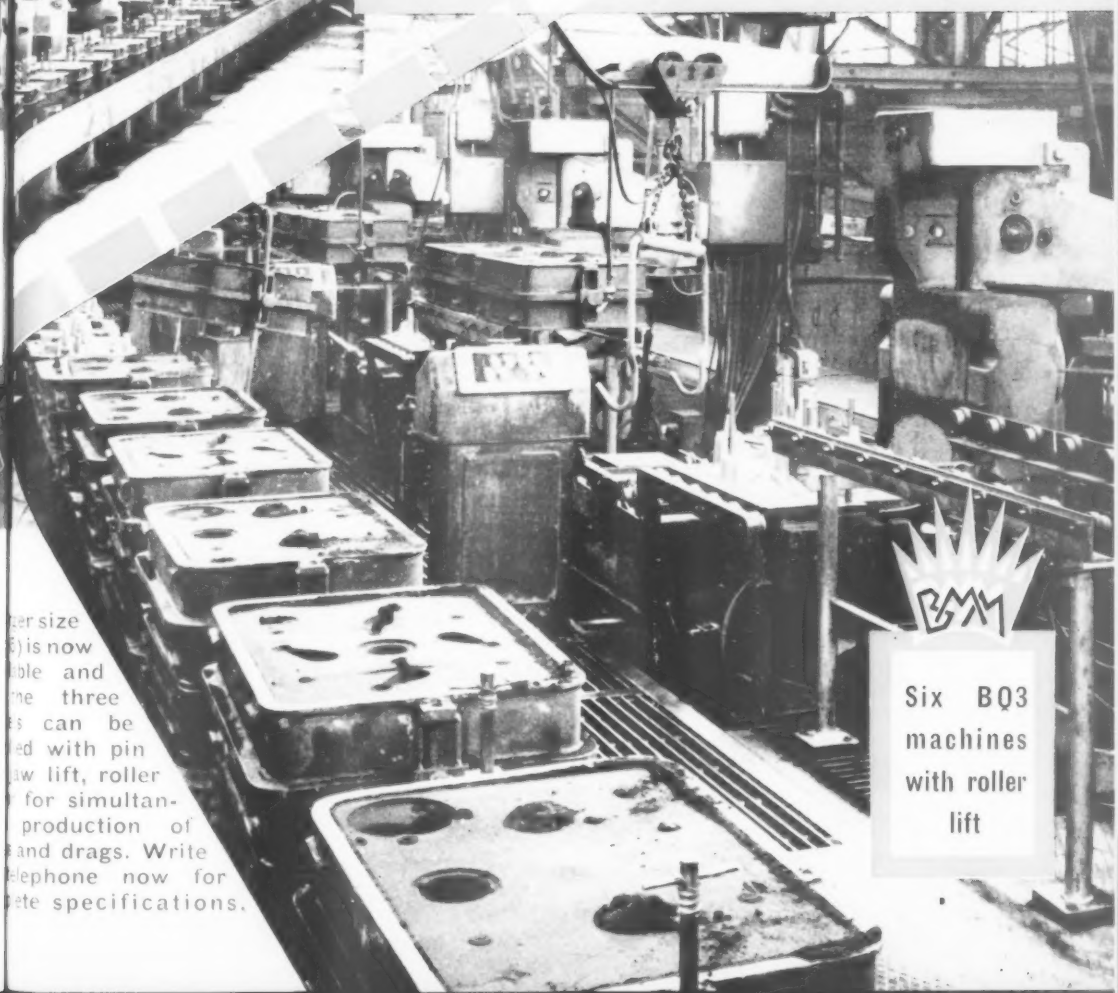

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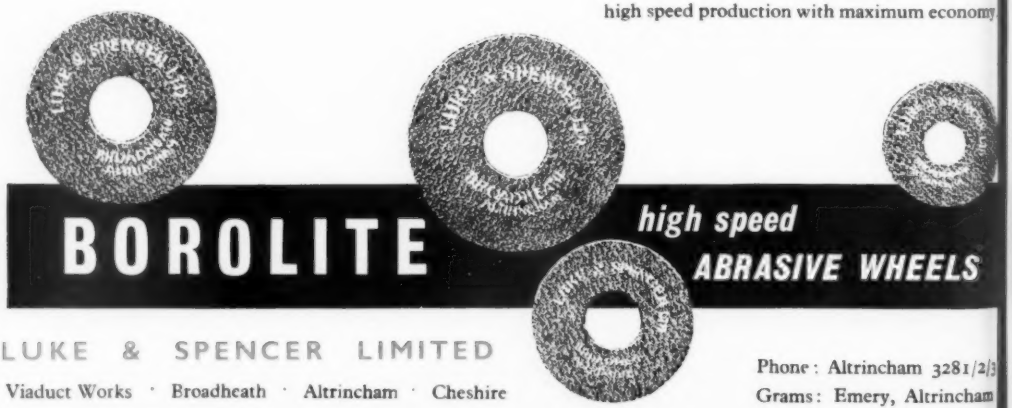

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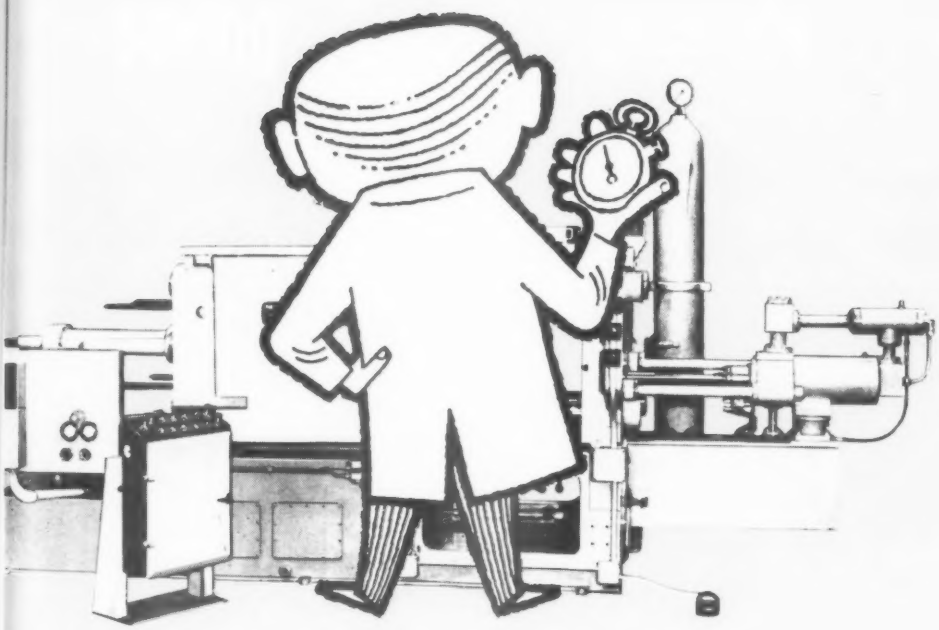

PECO's industrielle plasticforskning og -udvikling er blandt Storbritanniens bedste. Peco fremstiller en af verdens førende *pressestøbe*maskiner. Det er virkelig ulejligheden værd at skrive efter Peco specifikationer.

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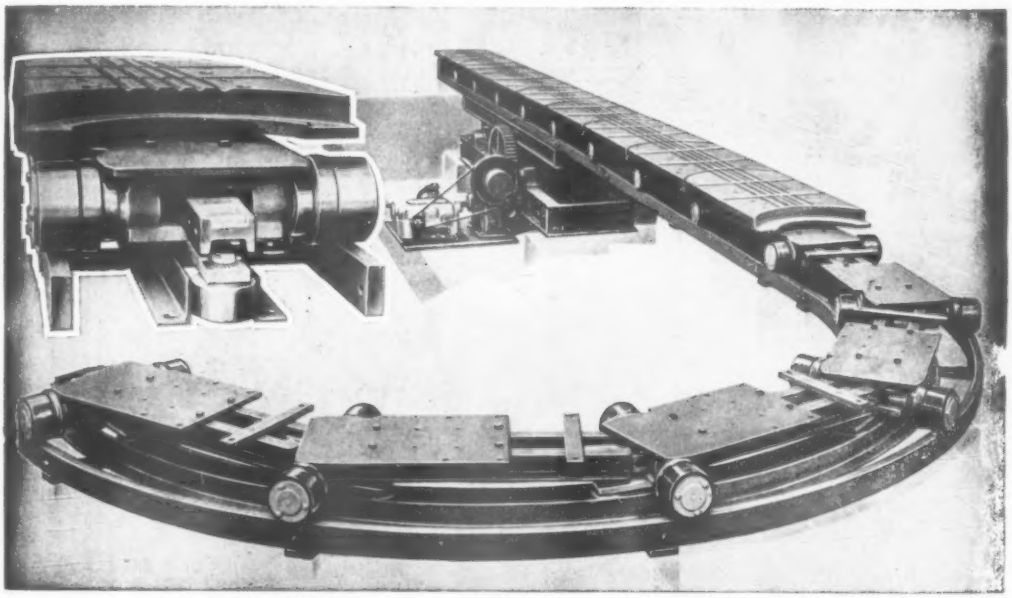
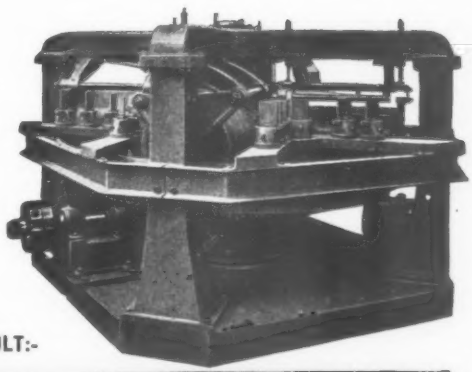


TYPICAL MOULD CONVEYOR SHOWING SOME C.I. PLATES REMOVED, ALSO DETAILS OF AXLES. SIZES TO REQUIREMENTS



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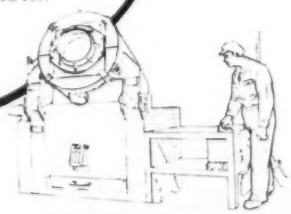
All these items were found to be contained in one particular furnace and inspection has been called for.



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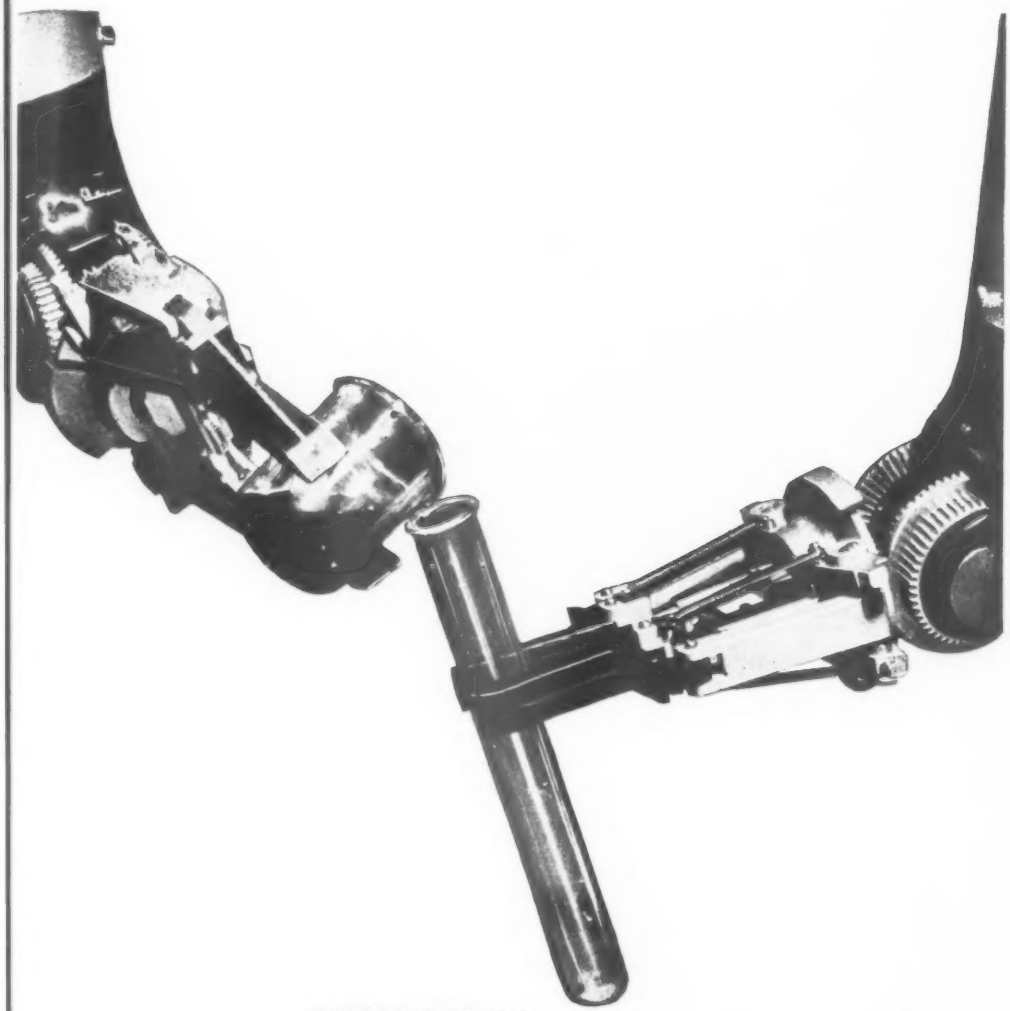

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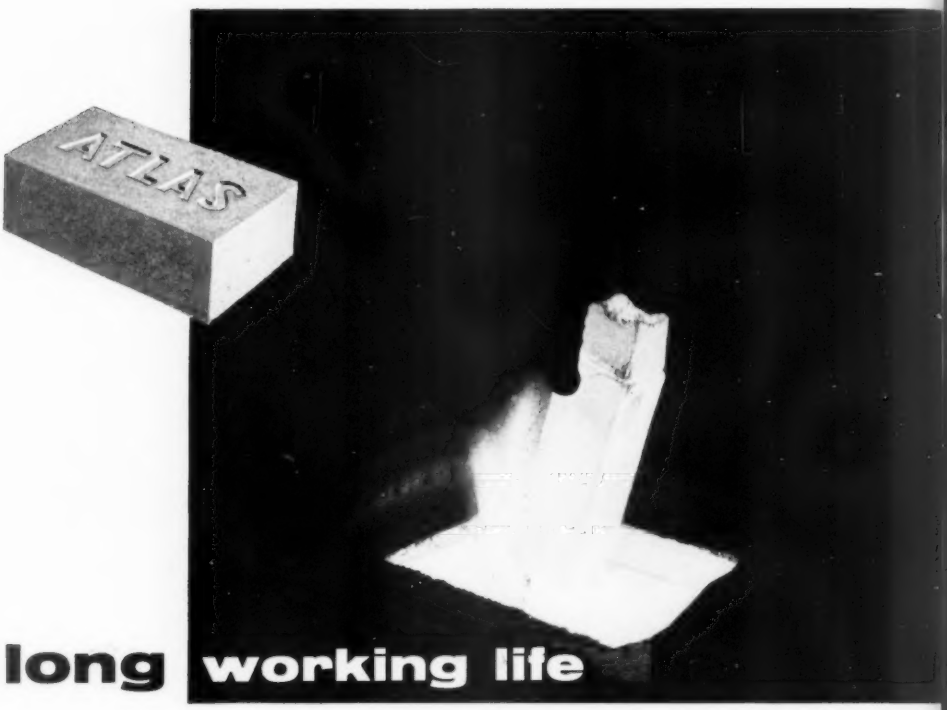

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the essential quality of a refractory—
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That is the measure of ATLAS firebricks.
When next considering refractories remember that ATLAS has been 'carrying the load' for a very long time.

ATLAS Firebricks (37/39% Alumina)
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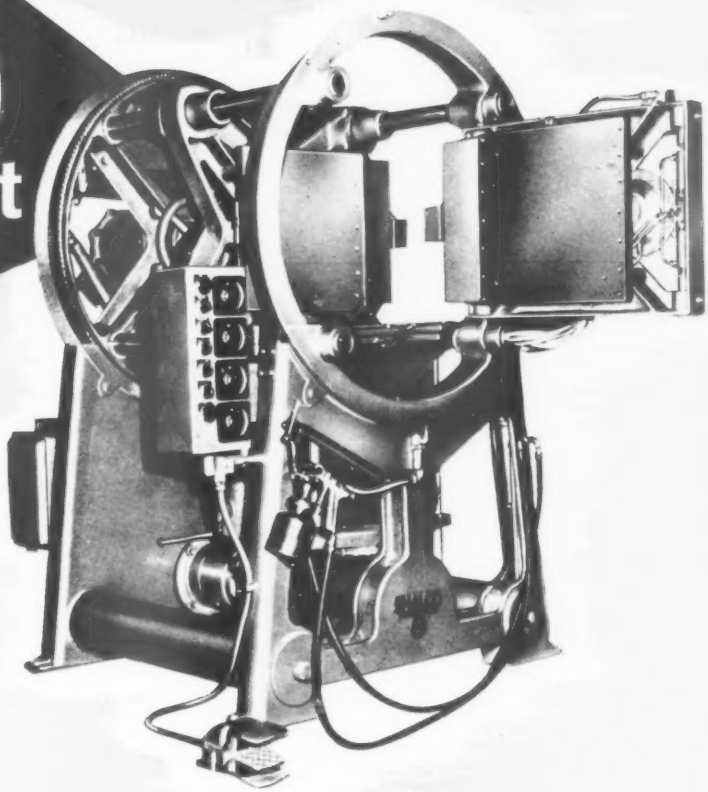

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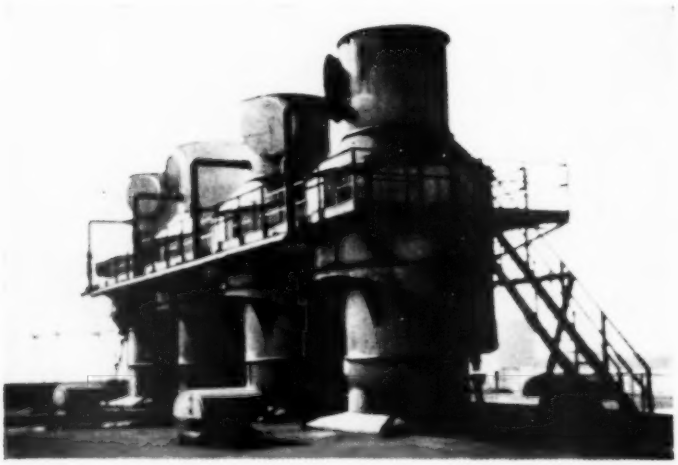

Many Foundrymen think Wet Spark Arresters are a recent development and because of troubles experienced with some installations, usually caused through bad design, they tend to regard them with suspicion.

We are proud that FORD MOTOR CO. selected **TITAN** Wet Spark Arresters for the **4 TITAN** 30 ton per hour Hot Blast Cupolas which we installed in their new Thames Foundry, the most modern in Europe.

These are illustrated, the second Cupola from the left is " blowing " —note the complete absence of dark smoke, sure proof of efficiency.

Photo completely untouched taken during normal operating conditions.

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- **Reduce Maintenance or Replacemen of Gutters, Drains and Roof Sheeting**
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- **Eliminate Fire Hazards. It's worth approaching your Insurance Company!**
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The Sklenar one-ton furnace melts 2,240 lb. of bronze or brass in 40 minutes; 800 lb. of aluminium in 20 minutes; or 1,200 lb. of grey iron in 50 minutes.

SKLENAR

furnaces for general duties in the foundry.

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SKLENAR furnaces melt light alloys, brasses, bronzes, and grey iron in sequence with no risk of contamination.

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SKLENAR furnaces give quick melts (500 lb. brass in 35 minutes) with low metal losses (maximum under 2 per cent.). Finger-tip control of atmosphere for melting non-ferrous metals is standard.

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SKLENAR oil or gas fired furnaces save fuel (0·008 gallon of fuel oil or 4 cubic feet of gas per lb. of metal are typical). No crucibles to renew—no spares to worry about.

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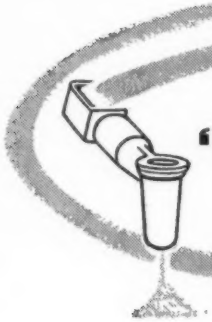

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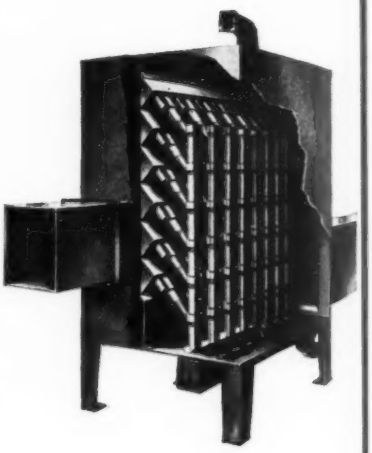

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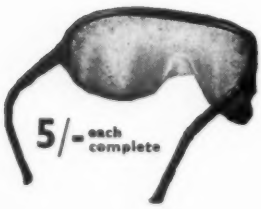

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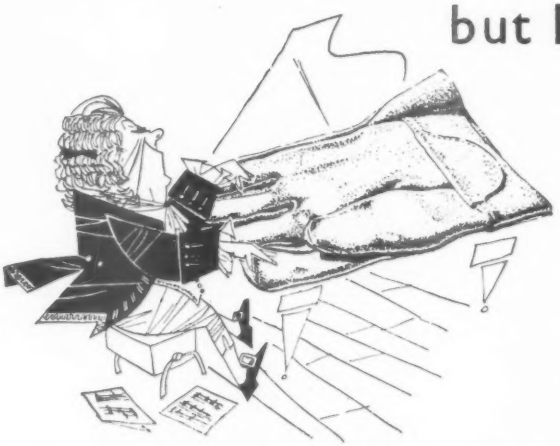

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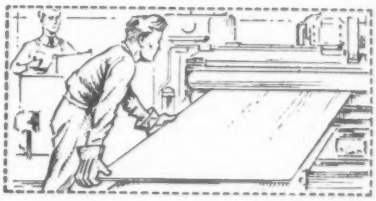

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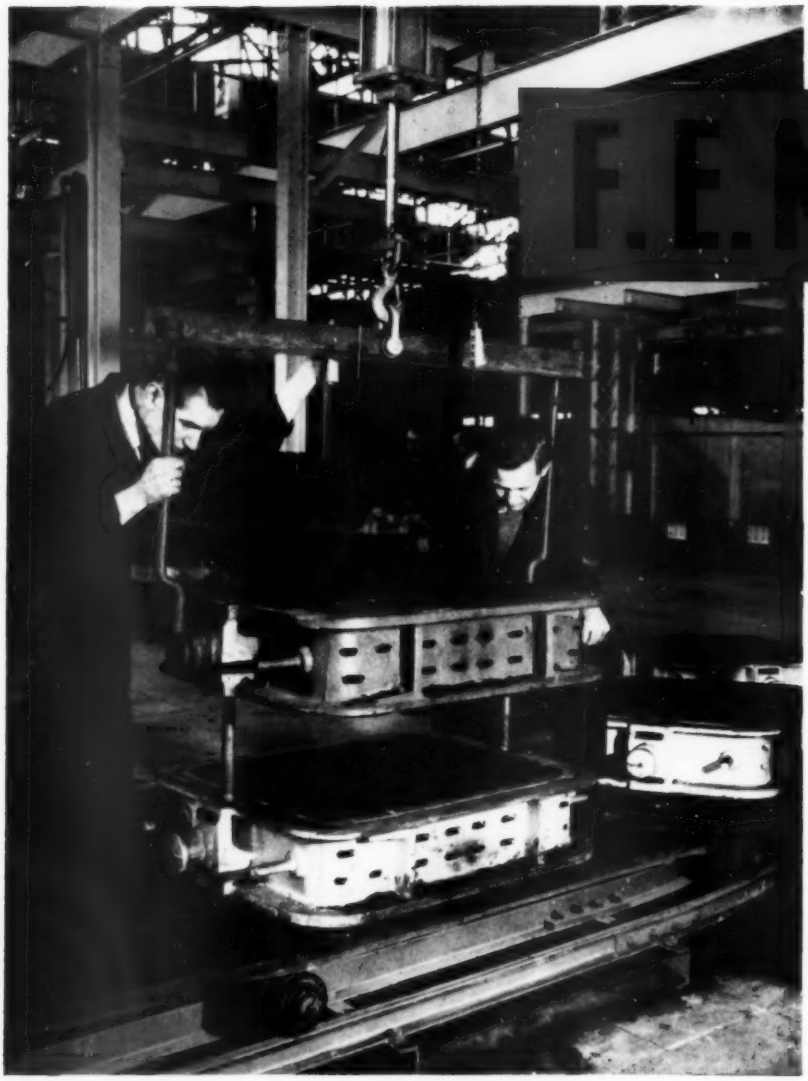

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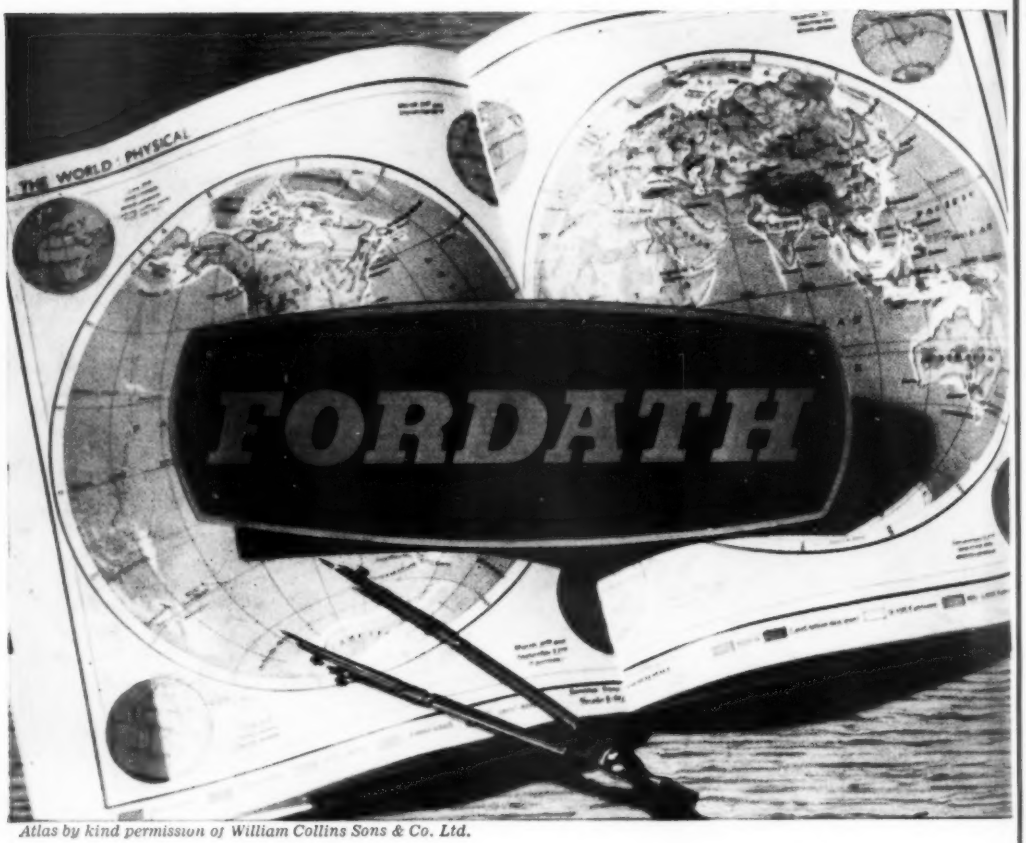

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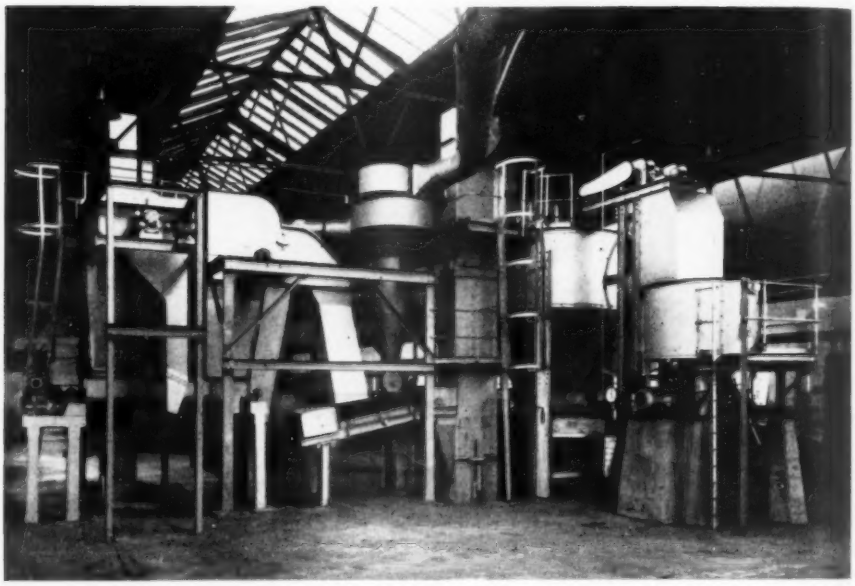

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FOUNDRY
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Vol. 109 July 14, 1960 No. 2275

The Iron and Steel Board and the Foundry Industry

The Iron and Steel Board, from Norfolk House, St. James's Square, London, S.W.1, have just issued a booklet* carrying its name, with a sub-title "What it is and what it does." Amongst its many statutory duties, the Board has the overall supervision of iron foundries and to do this, it is in close relationship with the Joint Iron Council. In order that proper liaison with the ironfounding industry should be maintained, the Board has appointed for this purpose Mr. A. E. Pearce, formerly managing director of Midland Motor Cylinder Company, Limited. Another part-time member, though representing a large user of steel, is Sir Henry Spurrier, chairman and managing director of Leyland Motors, Limited. He, too, is well versed in the activities of the foundry industry as he is a manufacturer of both iron and steel castings.

The activities of the Iron and Steel Board are well set out in this booklet and for guidance, it collects and publishes statistics of production, stocks held and employment figures. These include a number of entries of real value to ferrous founders, when intelligently interpreted. Such statistics, together with an examination of material from many sources, enable the Board to make forecasts for the future conduct of the iron and steel industry, and to approve and sanction expansion schemes—if they are to cost more than £100,000. This last proviso does not apply to iron and steel foundries for the booklet states: "Foundries, although within the Board's general field of responsibility for development, are excluded from the obligation to submit schemes. The Board endeavours to keep in touch with developments in the ironfounding industry through meetings with the Joint Iron Council and from time to time by special inquiries of individual foundries about the extent to which they are modernizing and developing their plants."

The Board is represented on the Council of the British Cast Iron Research Association, as it is one of its duties to keep research arrangements under review. Because both the British Iron and Steel Federation and the Council of Ironfoundry Associations operate efficient training committees, the Board has refrained from taking any direct steps to promote training and education. As far as we can see from the booklet, the ferrous foundry industry, so long as it conducts its business with circumspection, has everything to gain and nothing to lose by close co-operation with the Iron and Steel Board.

* Distributed to libraries, Members of Parliament, research and technical associations, etc., and presumably available to individuals on application to the Iron and Steel Board, Norfolk House, St. James's Square, London, S.W.1.

IBF Golf Meeting

This year's meeting and competitions of the IBF Golfing Society are to take place at the customary venue—Woodhall Spa, Lincolnshire—on Saturday and Sunday, September 24 and 25, when there will be the usual party arrangements at the Golf Hotel. After the presentation of prizes at the Society's annual general meeting on the Saturday evening, there will be an informal dinner/dance. This year, Mr. Charles Wilson, the immediate past-president of the IBF, will be presenting the two IBF tankards. Members and non-playing members will be very welcome at this event, and those interested in participating should write as soon as possible to the secretary of the Society, Mr. J. Graham Phillips, c/o Harper Phillips & Company, Limited, Albion Foundry, Eastgate, Grimsby, informing him of their intention and requesting entry forms. Accommodation bookings should be made direct to the hotel, where special terms are offered for the period Friday evening to Sunday lunch-time inclusive. Entrance forms should be returned not later than the first week in September, and to help the organizers it has been decided that this year subscriptioos, green fees, and sweepstakes, should be sent in with the entrance forms.

Programme

On the Saturday morning there will be stroke competitions for the IBF Handicap Challenge Cup; the Scratch Challenge Cup; Veterans' Cup and the Coronation Shield, and in the afternoon, a two-ball foursome competition against bogey will be held; the Stableford fourballs (three-quarter handicap) will be held on the Sunday morning. The ladies will compete on the Saturday morning for the Coronation Rose Bowl, and it may be possible to arrange a ladies' competition on the Sunday morning also.

"John Bell" Travelling Scholarship

As briefly announced in last week's JOURNAL, the IBF "John Bell" travelling scholarship for 1960 has been awarded to Mr. R. P. L. Salmond, who obtained first-class honours in his Assoc. Met. finals in Glasgow this year. Mr. Salmond is 24 years old and was educated at Milngavie Junior Secondary School and Bearsden Academy, where he gained the higher leaving certificate in 1953. On leaving school he joined William Beardmore & Company, Limited and began part-time day-release classes at Coatbridge Technical College where he obtained distinction in the Ordinary National Certificate in June, 1955. Two years later he took the Higher National Certificate (with foundry practice, metallurgical analysis and physical metallurgy as main subjects and physical chemistry and general metallurgy as subsidiaries). Two years ago his H.N.C. was endorsed with special mention in fuel technology. In that October, he became a full-time student at the Royal College of Science and Technology where he entered the third year of the course for the Associateship in Metallurgy.

Acknowledged, with thanks . . . .

The Editor wishes collectively to thank the many wellwishers who have written congratulatory letters consequent on the change in editorial responsibility announced in last week's JOURNAL. Early opportunity will be taken of replying personally to each one. At the same time, Mr. V. C. Faulkner adds his appreciation of numerous letters expressing readers' tributes for his many years in the chair and their good wishes for the future in his new capacity.

Certificate of Craftsmanship

The reconstituted City & Guilds Advisory Committee on Patternmaking and Foundry Practice held its first meeting last month. The Committee now includes representatives of the Institute of British Foundrymen, the four associations—the Council of Ironfoundry Associations, the British Steel Founders' Association, the Association of Bronze and Brass Founders, and the Light Metal Founders' Association—and the National Society of Master Patternmakers; the Engineering and Allied Employers' National Federation and the British Ironfounders' Association, the Amalgamated Union of Foundry Workers, and the United Patternmakers' Association. In addition, the Worshipful Company of Founders and various educational interests, such as principals and teachers, are represented.

At last month's meeting the main item of discussion was the CFA report on foundry apprentice training, and its main proposal, the introduction of a Certificate of Craftsmanship, was approved in principle by the Committee. The discussion revealed unanimous support for the idea that there should be recognition of practical craft skill in this form and it was decided to set up a sub-committee to work out the practical details and to report its findings to the main committee. Mr. J. Blakiston, M.I.MECH.E., past president of the IBF, was elected chairman of the C & G Advisory Committee (in succession to the late Dr. J. E. Hurst), and Mr. Frank Shepherd, a member of the CFA Training Committee, was elected vice-chairman. Mr. Shepherd will also preside over the sub-committee's meetings.

Dorman Long Steelmaking Project

Plans to spend £6,800,000 for improving efficiency further and increasing iron and steel making capacity were announced last week by Dorman Long (Steel), Limited, which last year completed its £60,000,000 post-war development programme. The Iron and Steel Board has approved proposals by the company to install a sixth 360-ton tilting open-hearth furnace and a third 600-ton mixer at the company's Lackenby steel plant. Facilities will be provided for the full application of tonnage-oxygen-steelmaking techniques to all open-hearth furnaces at Lackenby.

Approval has also been given to the building at the Clay Lane blast-furnace plant, Cleveland Works, of a third 27 ft. 6 in.-hearth blast-furnace of 1,500 tons per day capacity. Total estimated capital expenditure is £6,819,000. Work on the developments will begin immediately and member companies of the Dorman Long group will be responsible for construction.

It is expected that the new units will be in operation by the end of 1961. Dorman Long ingot capacity will be raised to 2,600,000 tons a year by the developments, which are designed to provide sufficient ingot steel to allow full advantage to be gained from the increasing potential of the company's existing rolling mills.

BRITISH NORTHROP SALES, LIMITED—Mr. J. N. B. Cardwell, Mr. P. Franklin, and Mr. F. C. Sheldon have joined the board.

Foundry Technology in South Africa

Report of Second Annual Conference of the South African Branch of the Institute of British Foundrymen

The second annual conference of the South African branch of the Institute of British Foundrymen was held in Johannesburg in the late Spring. Some 70 members and guests attended and the chair was taken by Mr. K. H. Coombs, president of the branch. Three papers were presented during the day's proceedings, two in the morning and one in the afternoon, and what follow are abstracts of the papers given (they form an interesting complement to the proceedings of the conference at Malvern reported on in last week's issue of the JOURNAL).

Largest Malleable Iron Foundry in Africa

By J. Peers

In the first paper given before the conference, Mr. Peers said that 10 million malleable-iron castings per annum—giving an approximate weight of 7,000 tons—was the current production capacity of African Malleable Foundries, Limited, Benoni. In 1958, America produced 970,000 tons of malleable-iron castings and Great Britain 164,000 tons. Following a brief description of whiteheart and blackheart malleable iron, the author said that recent years had seen the development of the pearlitic malleable irons whereby, with controlled heat-treatment of white-iron castings of the same base metal as blackheart malleable, a metal structure having temper carbon nodules in a pearlitic matrix could be produced. The foundry described by Mr. Peers was established in 1944 and the first malleable castings were produced in 1945. The factory had three acres under roof and was set up mainly for repetitive production; mechanization in various departments had been applied wherever it had been found practical. With the exception of a small export demand, the output of the foundry was entirely consumed on the home market and the castings produced covered the requirements of industrial, mining, and domestic activities and included a range of water and gas fittings up to 6 in. and electrical-conduit fittings up to 2 in. All malleable castings produced conformed to BSS 310/58 and more than half the total products bore the South African Bureau of Standards mark of quality.

Patternmaking

The foundry had its own patternshop and was fully equipped to produce both metal and wooden patterns. It had a moulding and non-ferrous melting section for the production of metal patterns and matchplates and was responsible for the pattern store where approximately 5,000 production patternplates were coded and stored. In the patternshop, too, coreboxes were made of light-alloy and prepared for the firm's coreshop. Mr. Peers said that experiments were in progress with epoxy-resin coreboxes and they showed encouraging results.

Coremaking and Moulding

Washed silica sands were used for coremaking, all incoming sand being dried in a coke-fired rotary sand drier and allowed to cool before use. A typical core sand mix used in the foundry being described consisted of 300 lb. washed silica sand, 1 to 1.5 per cent. linseed oil, 2 per cent. dextrine, 1 per cent. bentonite and 1.5 per cent. water. Core shooting was extensively used and cores from ½ oz. to 22 lb. were made successfully on the range of machines installed. The core-baking ovens were of the vertical or tower type and were continuous in operation. The production of the coreshop (Figs. 1 and 2) was planned on a day-to-day basis and preceded the foundry planning by one day. This arrangement ensured a build-up of prepared cores required by the foundry on the following day, and core counts were taken at the packing stations to check production figures.

FIG. 1.—*Section of the mechanized coreshop at African Malleable Foundries, Limited, at Benoni. Production of cores precedes moulding operations by one day.*

FIG. 2.—*Moulds banked on roller conveyors for core laying and closing, prior to transfer to another conveyor for pouring.*

For moulding, there was a battery of 10 jolt/squeeze/stripping machines arranged in line under overhead sand hoppers. The machines had 28 by 18 in. tables and were set up in pairs for cope and drag production. A full day's run on a pair of these machines would produce 750 to 900 complete moulds, depending on the job in hand. Cast-iron moulding boxes, 20 by 14 by 6 in. were employed and the closed moulds were transferred by roller conveyor set on a slight incline to the main pouring-line.

After casting, the moulds gravitated to four cooling lines, each of which could accommodate 30 cast moulds. On the basis of 3,000 moulds cast in nine hours, this allowed a cooling time of 10 to 15 min. per mould. The same base silica sand as used for coremaking was employed as a facing sand in the mould. The characteristics of this sand were green strength 8 to 10 lb. per sq. in., permeability number 50 to 60, moisture content 3.5 to 4.0 per cent., and the shatter-test index 60 to 70. The facing sand was prepared in two 500-lb. capacity batch-type mills and was delivered sieved and ready for use to the operators.

Metal Melting

Metal was melted by a duplex process using a 48-in. dia. water-cooled cupola for primary melting and a 20-ton pulverized-coal-fired air furnace (Fig. 3) for superheating and refining. A cold charge of 15 to 20 tons of metal was melted in the air furnace during the night so that a bath of hot metal was available at the beginning of the production shift, the metal having been checked and adjusted to within the desired analysis range by laboratory personnel during the early hours of the morning. Cupola metal was fed directly into the air furnace at such a rate that there was at least 10 tons of metal in the bath. Daily production ranged between 50 and 70 tons of metal melted and the cupola produced molten metal at the rate of 6 to 7 tons per hr. The 1,000-lb. metal charge was made up of pig-iron, returns and steel scrap and was used with a coke ratio of about 7:1. The metal composition aimed at was C 2.5 to 2.6, Si 0.9 to 1.2, Mn 0.40 to 0.50 and S 0.09 to 0.12 per cent. Six pouring ladles travelling on monorail tracks delivered the metal from the air furnace to the casting bay.

Annealing, Fettling and Galvanizing

Castings for annealing were packed into cast pots, spent moulding sand being used as a packing material. The pots were built up, six high, and conveyed by mechanical fork-lift loaders into one of seven annealing ovens (Fig. 4). These are individually fired by pulverized coal from small Attritor-type units and have an area of 20 by 11 by 8-ft. high and hold 34 of these stacks.

For fettling (Fig. 5), 20 double-ended grinders are arranged in four lanes and these handle the

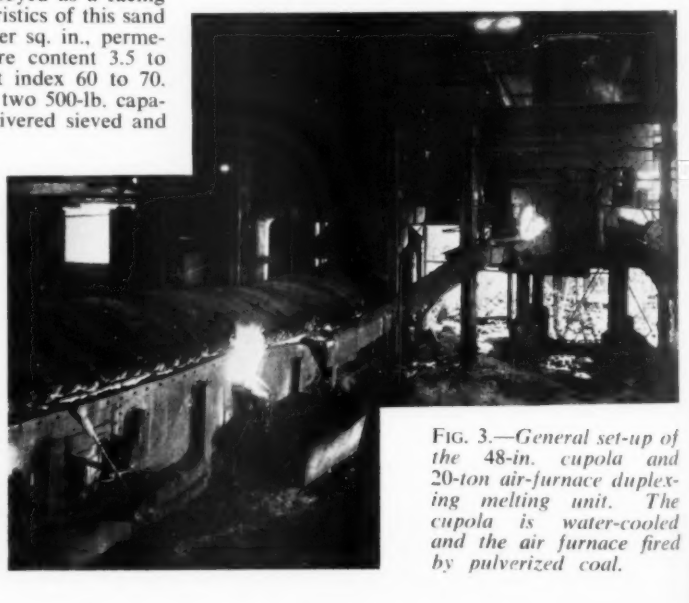


FIG. 3.—*General set-up of the 48-in. cupola and 20-ton air-furnace duplexing melting unit. The cupola is water-cooled and the air furnace fired by pulverized coal.*

daily volume of work. The most economical grinding practice for annealed castings has been established at peripheral speeds from 9,000 to 9,500 ft. per min. using resin-bonded wheels with grading values of A 14 QB 11. Castings are cleaned in an airless shotblasting machine of the rotating-barrel type, using angular white-iron grit and a cleaning cycle of 10 min.

Approximately 70 per cent. of all water and gas fittings, 20 per cent. of all electrical-conduit fittings (Fig. 6), all overhead line hardware and a variety of miscellaneous castings are hot-dip galvanized in the company's own plant. The plant consists of two kettles 6 by 4 by 5 ft. deep, electrically heated and controlled at a temperature of 450 deg. C. Each kettle holds 12 tons of zinc and has a 12-in. layer of molten lead at the bottom to improve heat-transfer and facilitate the removal of dross. Various tanks for stripping, pickling, rinsing and fluxing make up the rest of the plant.

Quality Control

The company has set quality-control standards which ensure that the finished article possesses the characteristics set out in BSS 310/58 for blackheart malleable iron, and has a fully-equipped laboratory to meet these requirements. Quantitative analysis for Si, C, Mn and S are obtained at hourly intervals throughout the day, using a spectro-absorbtiometer for quick Mn and S determinations and the combustion methods for C and Si determinations. Adjustments to the metal in the holding furnace are made depending on these determinations. The company's laboratory is also responsible for routine destructive testing of standard test-bars, all sand testing and technical control of the hot-dip galvanizing plant. An inspection department is responsible for control of dimensional tolerances and is free from production or departmental ties and concerns itself only with quality control.

Trends in Arc-furnace Steel Practice

By Dr. W. Bleloch

The second paper presented during the annual conference was given by Dr. W. Bleloch and his subject was "Trends in Arc-furnace Steel Practice." After a brief historical introduction, the author stated that the present capacity for arc steel was of the order of 12 million tons per annum in the USA and probably 20 million tons in the Western world (including the USA). The demand for electric steel was increasing. The top-charging method had enabled the capacity of electric furnaces to increase in unit size and a 250-ton unit, using six electrodes was now planned. It was expected that with the use of oxygen refining, production rates in excess of 50 tons per hr. would be obtained with this unit. By reverting to the 1920 idea of six electrodes, the author said that many of the difficulties presented to designers of large melting units could be surmounted. On this basis, a step up in electrical capacity to 50,000 kva in an arc furnace was possible by construction of the electrical side to operate with three transformers—a main transformer feeding and two auxiliary transformers. Such new "giant" arc furnaces would be equipped with 24-in. dia. electrodes, requiring motor generator capacity of approximately 75 h.p. per electrode for governing power input. A factor which in itself had made the operation of large arc furnaces a practical possibility was the air/blast circuit breaker. The large arc furnaces had become practicable only through many improvements in tilting mechanism, electrode-mast design and remote-controlled contact shoes and clamps. A problem which was only now being tackled with some degree of success was the installation of fume hoods and gas-cleaning and handling equipment which had greatly improved working conditions at some plants.

FIG. 4.—*Part of a battery of batch-type annealing ovens fired by pulverized coal and each holding about* 200 *pots.*

The six-electrode furnace would have an elliptical bath 35 by 24 ft. and would take a charge initially of 125 tons for a final tap of 250 tons. When making plain carbon steels, this unit should turn out four complete cycles per 24 hr. and would therefore make over 40 tons of steel for a yearly output of over 240,000 tons. Two such furnaces, the author said, would therefore do the work of three 35.0 mva. three-electrode units for a production of 680,000 tons of steel annually. It was possible that large arc furnaces would have a productivity, even for highly-alloyed steels such as the top grades of stainless and other chrome steels, that might eventually make them competitive with the open-hearth plant in its own field of carbon-steel production.

Refractories

The author said that much work was now being done on the basic roof to provide an all-basic fur-

FIG. 5.—*Corner of the fettling shop at African Malleable Foundries, Limited, showing the extensive use of tote bins on roller conveyor to reduce handling and lifting.*

nace and its was considered likely that the large units of 25 mva. and the still larger six-electrode furnaces would ultimately be constructed with either a sprung or a suspended all-basic roof. The successful attainment of an all-basic furnace was likely to be the determining factor in the ultimate size of arc furnace attainable in practice.

Melting Practice

The tendency in melting practice in recent years was to devote a great deal of time and effort to the limitation of delays, and the objective of obtaining the shortest possible time between charging and tapping had become of primary importance in arc-furnace practice

Carbon Steels

For carbon steels, the modern technique of oxygen blowing in the arc furnace had greatly improved the cleanliness of the finished steel and had improved output, but apparently not to the same extent as it had in open-hearth plants. At steel plants where hot metal was available, attempts had been made recently to operate arc furnaces with as much as 40 per cent. of hot metal in the charge. This innovation had been undertaken on the score of less graphite, larger output and lower power-consumption, even at the expense of lower metallic-yield. It was evident, at present, the author said that if the hot-metal process was to continue in electric-arc plant, it would have to be conducted on hearths which were larger in relation to the bath depth than those used in conventional arc furnace steel production.

Alloy Steels

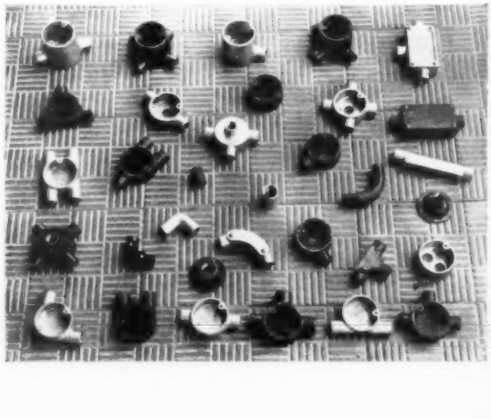
The advent of oxygen-refining techniques had revolutionized chromium-steel production. The effect of oxygen refining on chrome steel production technology had been far greater than its effect on straight carbon steel production in the electric furnace because (1) it enabled use to be made of nickel- and chromium-bearing "revert" and "outside" scrap, and (2) it made a much cleaner chromium steel than the straight arc-furnace process, using ore for carbon removal.

Electric-arc *versus* Open-hearth Furnaces

Finally, the author concluded his paper by saying that probably the greatest field of expansion open to the electric-arc furnace was in the manufacture of straight carbon steel in direct competition with the open-hearth furnace. The comparison between the two types of furnace was complicated by many types of factors, and had formed the basis of extensive study during the last decade. The assessment of the electric-arc furnace as a competitor of the open-hearth was also complicated by the advent of the oxygen-converter process when used in fully-integrated plants. This relatively new process for large-scale steel production was likely to exert a major influence over both the open-hearth and the electric-arc furnaces.

All that could be stated at present was that the main field in carbon-steel production with large capacity arc furnaces was likely to remain that

FIG. 6.—*Typical range of malleable electrical-conduit fittings produced at the Benoni foundry. Much of the production is hot-dip galvanized before despatch.*



of melting all-cold scrap charges. A great deal of improvement in both design and operation would have to be undertaken before any of the present designs of arc furnace plants, even those incorporating the very large units, would tend to replace the integrated hot-metal open-hearth shops in the production of carbon steels.

Work-study

By C. M. G. Wallwork

The first sponsored paper to be presented in South Africa from the Institute of British Foundrymen was presented in the afternoon of Conference day. The paper entitled "Work-study" had been prepared by Mr. C. M. G. Wallwork, president of the Lancashire branch, and was read by Mr. B. H. Truter.

In this paper, work-study was described as systematic activities concerned with the investigation, recording, measurement and improvement of the following work factors:— (*a*) what the operator did; (*b*) the tools and equipment used; (*c*) materials used and (*d*) working conditions. Two of the most important words in this definition were "systematic" and "improvement" the author said. Work-study should always be planned and carried out to a programme, however flexible, and should never stop at mere measurement of work, but should always aim at improvement. It should also be concerned with the human satisfaction which operators got from doing their work and the effectiveness of their work depended very much on morale. Operators should not only know what they were doing, but should "like what they knew." Work-study could contribute greatly here, but it was not likely to achieve much without the willing and intelligent co-operation of operators.

Method-study and Time-study

For the purpose of analysis and training, work-study fell naturally into two major divisions—method-study and time-study. In modern practice these were, or should be, very closely integrated.

Accuracy

So far as work-study aimed at such things as objective analysis and to isolation or control of variables, followed by measurement and the testing of results, it might justly be described as scientific. However, since work-study consisted fundamentally of the assessment by human beings of the performance of other human beings, it could not be an exact science. Work-study should always strive to achieve scientific standards of integrity and this, among other things, required a recognition of the limits of approximation—sometimes very wide—in the quantitative results obtained. For example, the practice of quoting standard times to thousandths of a minute could seldom, if ever, be justified, in view of the nature of the observations from which such times were derived.

Fact Finding

The first phase of any work-study application should always be to find the true facts and this was predominantly a question of method study. No "hard-and-fast" rules could be laid down for fact finding, except that all the factors which might influence working methods and work content must be put on record than analyzed and classified as appropriate.

Job Improvement

It was usually necessary to start recording conditions and methods exactly as they were found, *i.e.*, to draw up original method job specifications. Nevertheless, steps should be taken from the earliest possible moment to develop improvements. This was usually best done in detail and by stages, although sometimes a completely different or revolutionary approach might be advisable. In any event, job improvement should always be a co-operative affair in which operators, supervisory staff and technicians should participate as fully as possible. All suggestions and ideas should be examined carefully, written down and analyzed, according to their nature. Thus, a number of complete alternatives might often be listed in which some details are common and some are mutually exclusive.

Performance Rating

It is of course well-known that work can be done at different speeds and this is not just a question of speed of movement, it is also a question of the effectiveness of movement. Work-study is concerned with the speed or pace of doing work. If a datum or "norm" can be established for the rate of doing work, then comparisons can be made consistently. This is, of course, the essence of deciding what is a "fair day's work."

The author concluded his paper by giving an example of job engineering from his own foundry and underlined the fact that work-study was a tool with which planning control, simplification and improvement were facilitated. It was vital that its use should become more widespread in the foundry industry if greater efficiency was to be achieved.

* * * * *

All the papers presented at the conference were followed by lively discussions and at the end of the proceedings, a vote of thanks to the authors and to Mr. Wallwork (who was unable to present his paper personally) was given by Mr. R. T. Rounce, junior vice-president of the South African branch.

Retirement after Forty Years

Mr. Gilbert Griffiths has retired from the position of Midlands-area manager of General Refractories, Limited, on reaching the age of 65 years. Mr. Griffiths joined the company soon after the first world war in December, 1919, and became a member of the Institute of British Foundrymen in 1926. Through continued interest in the latter, he hopes to keep in close touch with his many friends in the foundry industry.

Notes from the Branches

Northampton Section

A party of 34 members of the Northampton and district section of the Institute of British Foundrymen visited the factories of Humber, Limited, Coventry, on June 10. On arrival at 10.30 a.m., they were welcomed by Mr. E. Fox, the foundry manager, and after refreshments, the tour of the foundry commenced, members being given complete freedom to go where they liked and to examine foundry methods, equipment, etc.

The foundry is not large in comparison with the total floor space of 3,000,000 sq. ft. covered by the Humber Road and Ryton factories, in which 8,000 people are employed, but it is compact, well equipped, and is, without doubt, an efficient foundry making a very useful contribution to the Rootes group's activities, supplying about half their needs of grey-iron castings.

Working only single shift, the output of castings is 275 tons per week from a labour force of 265 who are employed on a collective-bonus scheme. To do this the work has been selected to allow the foundry to specialize and so to achieve a high output from its small floor space. Basically the weekly production is of 2,700 four-cylinder blocks with an equal number of four-cylinder heads, 12,000 brake-drums and 2,400 flywheels.

Moulding Units

Two moulding units are provided, each with a continuous type of sand mixer, one mould conveyor travelling at 100 plates per hour for cylinder-blocks, and the other moving much faster at 300 plates per hour and carrying all other work. The cylinder-block moulds are made on a four-station turntable unit where a Sandslinger is used to ram up. The moulds were the best for uniform hardness, both on deep vertical as well as flat faces, that the visitors had ever seen. One 22-in. 'slinger is used to ram up both copes and drags and no facing sand or special tucking is used, although the mould is sprayed with a water-based wash before coring up.

The other mould conveyor is fed by three pairs of British-made jolt/squeeze moulding machines and 100 boxes per hour per pair of machines is normally attained, although plenty of labour is made available to ensure maximum production. These moulds were again very good but by no means as uniformly hard as those from the 'slinger unit which greatly impressed the members of the section.

Both mould conveyors pass close to a bank of four cold-blast 42-in. bore cupolas, two of which are run every day to provide the 10 tons of iron per hr. which is cast at approximately 1,350 deg. C. from 9 cwt. geared ladles, the smaller castings being poured from hand shanks for which a 9 cwt. ladle acts as a receiver.

Yield was said to be 70 per cent. and total scrap 1½ to 2 per cent. with a negligible amount of reclamation. No doubt the specialized manufacturing programme has something to do with this very satisfactory position but the general impression is one of good organization, attention to detail and employee well-being.

Semi-automatic knockouts are provided and the foundry is well served by pendulum conveyors throughout. The atmosphere is excellent, no doubt due to considerable use of piped-in fresh air as well as to the extraction of dust and fumes. The stockyard is covered in and spanned by an overhead crane with lifting magnet which supplies the working stock-bins on the cupola platform, the cupolas being hand charged.

Casting stripping is carried out on the first floor on electric vibrating grids, and a continuous conveyor-type shotblast machine is loaded at this point and later unloaded at ground level in the fettling shop. This shop is fitted with two continuous slat-type fettling conveyors, being quite orthodox in all other respects.

Simplicity the Keynote

This is an interesting and quite orthodox foundry (although some shell-coremaking is shortly to be started) and one in which simplicity appears to be the keynote of success, as exampled by the fact that only one sand and one core mixture is used whereas similar foundries often have four sands and up to 20 different mixes. Few or no artificial core-vents are provided and no wires are used in the water-jacket cores—a very desirable state of affairs but one which can only have been achieved by confident direction and sustained effort.

At lunch, the party were introduced to Mr. H. Pryor, the general works manager, who promised to meet them again after tea for a discussion and an opportunity of asking "the more difficult questions." Two hours later, after a tour of the machining and assembly shops, Mr. Pryor was as good as his word and spent a whole hour answering a variety of very interesting questions of a specialist and general character.

Mr. R. Jelley, the section president, who is himself an ex-Humber apprentice, proposed a vote of thanks to Mr. Pryor and the directors of Humber, Limited, for the opportunity to visit the works and for the excellence of the arrangements which everyone agreed could not have been better. The section left the works at 6.0 p.m. to travel to the Dun Cow Hotel, Dunchurch, for dinner, the works visit being the most important part—but only part—of the events arranged for the day.

South Africa

A record number of entries was received in the 1960 Short paper competition of the South African branch for the Alexander Medal and Prize. The medal was awarded to Mr. F. C. Goldsmith for his paper entitled "Some Chemical Treatments for Molten Aluminium." The prize was won for a paper entitled "Production of Aluminium/silicon-alloy Pistons for Petrol- and Diesel-engines" by Mr. F. P. A. Robinson. Both papers were read by the authors at the conclusion of the branch annual general meeting in May.

"Chemical Treatments for Molten Aluminium"

Mr. Goldsmith's paper dealt with the type of cover required during melting and subsequent grain-refinement for aluminium. The use of an appropriate composition as a cover during melting affords maximum protection by forming a barrier between the oxygen in the air and the surface of the metal, whilst strong oxide solvents can be added to the flux to ensure maximum separation of any metal that may be entrapped in the dross during the operation of skimming-off.

A correctly-compounded fluxing medium should react in the following manner: (*a*) Protect the metal from oxidation losses; (*b*) minimize the pick-up of gas from the furnace atmosphere, and (*c*) ensure maximum separation of metal entrapped or held in the dross.

Despite the fact that oxides can cause many troubles to the light-alloy melter, hydrogen will still remain the main enemy of the foundryman who deals with aluminium and its alloys. Gaseous chlorine has long been the medium used for the removal of hydrogen from aluminium but the majority of foundries, and some of the bulk refiners, prefer to employ hexachlorethane in the solid form in view of its ease of application.

Tricks of the Trade

A practical foundryman describes the special techniques and equipment which were used in the production of brake-and-clutch housings in a high-duty cast iron.

By "Jacques"

A substantial first order received by a firm for the 36-in. dia. brake and clutch housings shown in Fig. 1 (left), with a prospect of regular repeats, merited a careful discussion on the type of pattern, corebox, and moulding procedure which would be needed to ensure top-quality castings in a high-duty cast iron. Freedom from porosity and open-grained metal in abrupt changes of section (a not uncommon defect which sometimes comes to the surface in final operations after considerable machining has been done) was specified.

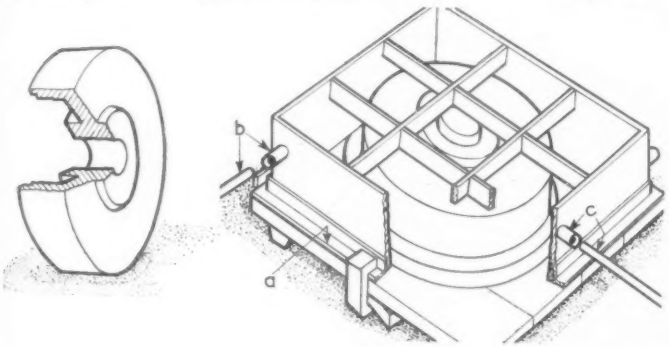


FIG. 1.—*(left) Brake-and-clutch housing, 36-in. dia., for which (right) a flat-back pattern was made to permit single-box-part moulding.*

The pattern was made flat-back for one box-part moulding as in Fig. 1 (right), a system which is eminently suitable for semi-skilled operatives, and which in this case was readily adapted to existing shop routine and tradition. Moulds employing cover-cores can usually be cast "green" with appreciable economies in handling, stove-drying or CO_2 Processing. The usual delays and interruptions while waiting for crane service (for mould roll-over, pattern draw and core handling, etc.) were entirely avoided by adopting the detailed arrangements shown in the sketches. These ideas proved very simple and practical, and were adapted also to other lines of production. They permitted jobs, which otherwise needed crane lifts, to be completely "manhandled," except of course for the 10-cwt. ladle pouring.

The fettled housing casting weighed approximately 6 cwt., and two per day were made in a special high-steel grey-iron mixture. This suited the routine established for the particular cupola in use, which was 5-cwt. charges and 10-cwt. collections of molten metal in the cupola well. This system was adopted for adequate identification of two 10-cwt. taps of this special iron. A chemical composition analysis sample, and a quick dip for a wedge test, were taken daily. This laboratory check proved the system to be consistently reliable, and the metal to specification. The cupola routine permitted three or more charges of the commoner mixings to be made first for "hotting up" the "zone." These first taps proved to be an adequate indication of whether the melting zone had reached a peak temperature to deal with, and allow to flow out of the taphole, 10 cwt. of "wick" metal at approximately 1,450 deg. C. (checked by optical pyrometer).

The pattern and general "tout-ensemble" for ramming the job up is shown in Fig. 1 (right). The light-section fabricated-steel moulding-box is stiffened with angle iron (a), and plain bars at the bottom, approximately 2 in. from the pattern face. Four short pieces of tube (b) are welded on to the sides to take the "loose handles," and another short piece of tube (c) is welded on as shown to provide a separate longer bar leverage to assist an "up-and-over" roll to the rammed-up mould, "bump-less" on to a level floor bed, as shown in Fig. 2.

The arrangement shown in Fig. 2 for drawing the pattern by hand shows the adaption of a discarded vehicle-jack (d). A permanent handle is fixed in place (e), and the centre screw is extended with a piece of tube in the manner shown at (f) to engage with the short item (g), which is riveted loosely in the plate. Dead-slow and clean pattern draws are assured with one operative on the jack and a "mate" to steady out. The jack-carrier bridge unit (h) is of light welded construction, and straddles the moulding box as shown. The two holes (j) permit the use of loose box-handles (k) for lifting the drawn pattern and bridge, etc., clear of the mould.

To fit in with the regular flow of core production, where there were no overhead lifting units, cores of this diameter were outside "man-handling" capacity and the stoving routine, but with one-half corebox split on the centre as shown in Fig. 3, the half-cores went into circulation alongside the

Tricks of the Trade

regulars. The tapered joints at (m) on each half-core are formed with a matching taper to each of the loose-pieces (l), used alternatively in the corebox.

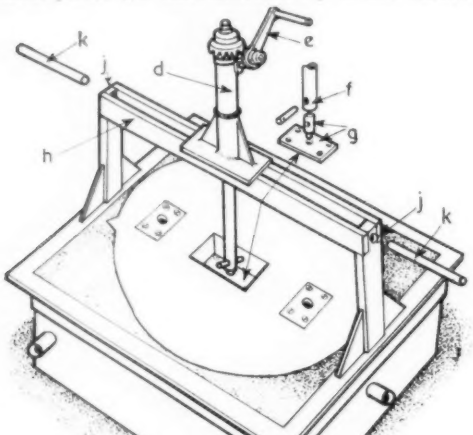
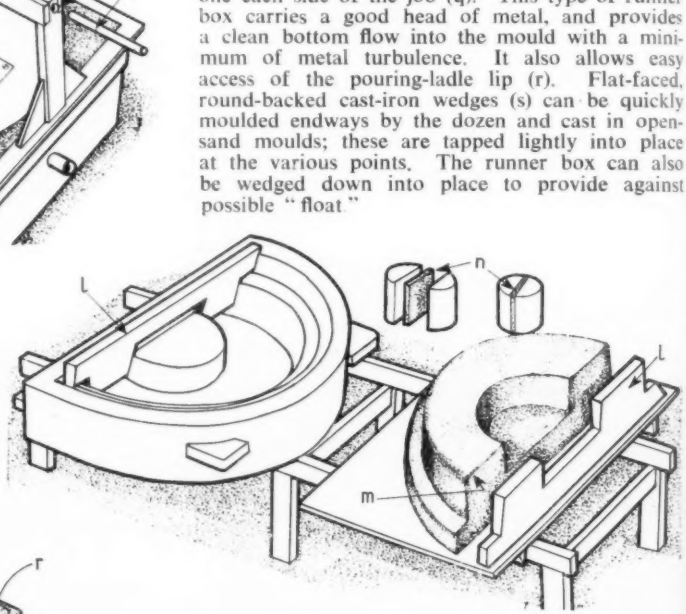


FIG. 2 (*above*).—*Arrangements made for drawing the housing pattern by hand, using a modification of a discarded motor-car jack to assist in steady withdrawal.*

FIG. 3 (*right*).—*Housing cores are split in half to adapt them to existing stoving facilities and procedure.*



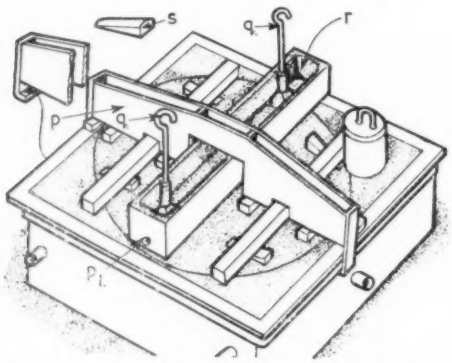


FIG. 4.—*Complete mould ready for pouring, showing the location of the large side-feeder-head.*

This tapered joint permits the half-cores to be lowered into the mould "spot-on," without rubbing. The two-piece centre chill (n), made of cast iron, is stuck (while warm) with a dab of core-jointing paste on to a sandwich core. This substantial heat-exchange device results in a close-grained material for the centre boss, and also saves the extra feed necessary when dealing with heavy-section and "hungry" metal.

One large side-feeder-head provides a good pressure-feed to the whole; this can be seen in Fig. 4, which shows the complete mould ready for pouring. The core-holding bridge cramp (p) is also of light steel fabrication, and hooks under the angle-iron rim and spans the dried ganister-lined runner-box. The runner box drain-hole (P1) permits this to be drained and used more than once—it is deep and narrow, with two runner stoppers, one each side of the job (q). This type of runner box carries a good head of metal, and provides a clean bottom flow into the mould with a minimum of metal turbulence. It also allows easy access of the pouring-ladle lip (r). Flat-faced, round-backed cast-iron wedges (s) can be quickly moulded endways by the dozen and cast in open-sand moulds; these are tapped lightly into place at the various points. The runner box can also be wedged down into place to provide against possible "float."

Results obtained from making several hundreds of castings in this way have been highly satisfactory all round, and have proved that the detailed planning at the start of the job was well worth while. The cost of the special tackle was soon recovered, a distinct saving of time was evident, and confidence in performance of this technique was quickly developed by the semi-skilled operators.

FOLLOWING PARTICIPATION in the recent Poznan (Poland) International Fair, the mobile exhibition of George Kent, Limited, travelled direct to Moscow where it formed part of a special six-day exhibition of new instruments and automation equipment, arranged in connection with the First International Congress of the International Federation of Automatic Control (IFAC). The event, organized by the USSR National Committee of Automatic Control in co-operation with National Member Organizations of IFAC, was attended by delegates from many different countries.

Ironfounding Health and Safety

Concluding Section of the Report of the Proceedings of the Blackpool Conference organized by the Council of Ironfoundry Associations

First Aid in the Foundry

By Dr. R. N. Wilson, M.B., B.S., D.P.H.

Continuing the technical sessions on the Thursday of the Ironfounding Health and Safety Conference*, held at Blackpool, the final paper of the day was given by Dr. R. N. Wilson, medical officers of the Stanton Ironworks Company, Limited.

Taking for his subject, "First Aid in the Foundry," Dr. Wilson first stressed the importance of fully using washing facilities as a major way to avoid dermatitis, as he said the main causes of this were dust and sweat. Next, he explained the difficulty of defining what constituted an "excessive" weight when lifting was involved, but gave general rules to be followed when lifting, saying, for example, that when using a heavy sledgehammer the back should never be arched. At Stanton, any men suffering from back strains were treated by physiotherapy and this had come to be regarded as a first-aid measure—a most important one, because after a lapse of hours remedial treatment became much more involved and loss of working time was almost inevitable. Dr. Wilson stressed the necessity of proper training of first-aid personnel—there was an inherent danger in a "little knowledge," he said, and aid should be left to skilled people. However, he went on to recommend that everyone in a foundry should know how to give artificial respiration for use in cases of electric shock, gassing and drowning. It was vital that this treatment should be applied within seconds of

* Earlier accounts of the Conference proceedings have appeared in the JOURNAL on April 21 and 28, and May 26.

At the CFA Safety Conference, informal discussions were continued even during the breaks for coffee, as these illustrations show. Recognizable amongst the groups photographed are a number of delegates prominent in health and safety committee and organizational work amongst the UK foundry industry.

an accident and it was no use trying to learn how to apply artificial respiration *after* a man had been electrically shocked! (At Stanton, all electrical staff and cupola staff were taught how to apply artificial respiration.) The second aid that should be generally known and taught was how to remove dangerous " foreign bodies " from the eye. Treatment here was just as urgent as artificial respiration and Dr. Wilson said that the average eye-bath was too small and suggested the use of an undine (which although still on the small side) was better. However, a 1-gall. wash-bottle with a delivery tube attached was better still and this should be always available as a permanent fixture on the wall of the first-aid room. While a number of eye-washing media could be suggested, there was no need to wait if special solutions were not immediately available, any non-harmful fluid was better than nothing.

Importance of Records

Continuing, Dr. Wilson stressed the importance of good first-aid records and said that the Accident Register should be made up daily and, if properly kept, would be of both medical and legal value. He recommended that a carbon copy of each day's report should be given to the works accident-prevention officer. Also, the foremen concerned should be immediately informed when a workman reported an injury. Details of *all* cases (not only those which led to lost time) should be reported.

Of minor accidents which occurred in mechanized foundries, those to the eyes were often highest in number and accidents to hands and fingers came second in those occurring most frequently. In non-mechanized foundries, it seemed this position was reversed. Turning again to the removal of foreign bodies from the eye, the presence of a person skilful in this operation was essential. Dr. Wilson said that the correct first-aid treatment was (*a*) to wash out the eye or (*b*) remove the foreign body with a corner of soft material. Any other method which might be practised as " first aid " could be dangerous and though it seemed superfluous to point out that penknives, matches, horse-hair, chicken bones, nails, wire, etc., must never be used, experience had shown they sometimes were—and on occasions with diastrous result! Experience had also shown that fitters, etc., were liable to eye accidents resulting from metal being struck and a piece entering the eye—in fact this was the major cause of serious eye accidents. Unfortunately, there was a reluctance amongst personnel to go to the works' surgery for eye treatment and this was quite widespread. Unofficial " first-aiders " could be recognized as sometimes performing valuable service, but should be cautioned to send people for skilled attention except in the most minor cases. Finally, he said, the use of drops was better than ointment for eyes.

Legislation

Turning to the subject of factory safety legislation, Dr. Wilson said this had grown up over the years, and (taken as a whole) was very complicated and difficult for lay people to understand. Nowadays, the size of the first-aid box specified for a given works depended on the size of the works and the number of personnel working there at any one moment. The various sizes of boxes only differed in respect of quantity, not the type of dressings, etc. To-day, first-aid boxes no longer contained iodine or gentian violet as it had been discovered that these could cause dermatitis, and in fact sometimes no fluids of any kind were supplied. Salvolatile, eye-drops or splints were not included. Eye ointment was included, but it was stipulated that this was only to be used when there was delay in getting a patient to the doctor.

Dr. Wilson said the instruction sheets supplied with first-aid boxes were open to some minor criticism. As an example, he said for electric shock, the leaflet included such words as " interposing " which a man on the shop-floor might not understand. The circular included with farm first-aid kits was worded better, he thought. Adhesive wound-dressings could cause trouble in themselves and a rubber bandage was really dangerous if it was used inexpertly, as its improper application could cause gangrene. Hence, only qualified first-aiders should have access to the key of first-aid boxes.

Dr. Wilson next demonstrated the range of first-aid boxes available and said that old-type boxes could be converted to conform to the new Regulations. For an average-size foundry the cost of a home-made box was approximately £2 plus about £4 10s. for its standard contents, *i.e.* about the same price as a ready-made-up one. An ambulance room was compulsory when a firm employed 500 or more people, and Dr. Wilson added that the use of safety colours in industry was a scheme worth following. Training for first aid had now been tightened up for factories employing 50 or more people, and the lecturer recommended the reading of the booklet " Preliminary First Aid to the Injured " which gave enough basic information for the average workman first-aider. It was necessary when teaching first aid to maintain pupils' interest and some financial inducement could really represent a good investment for a firm. A first-aider in industry was in an ideal position to act as confidant to workpeople and learn their troubles and difficulties, and thus could be invaluable in this sort of service to works' safety organizations.

Discussion

Members present so obviously found Dr. Wilson's paper fully informative that little discussion followed. The few points brought up included the question whether or not the services of a chiropodist was desirable in large undertakings, the reply being that if provided it would doubtless be used, but it was an expensive service for a firm to shoulder. Another questioner asked for confirmation about the inclusion of iodine and gentian violet in first-aid boxes. He was told iodine never was included now and gentian violet only on rare

occasions. Finally, Mr. Bonney voiced the thanks of the meeting to Dr. Wilson.

Discussion Groups

On the Friday morning of the Conference the first session was devoted to hearing and commenting on the *rapporteurs'* accounts of the discussion groups, which had been held on the previous evening. There were six of these reports, on the following subjects: (1) Noise as a health and safety problem in foundries; (2) the value of and recommendations for safety propaganda in the foundry; (3) inspection and maintenance and cleaning and housekeeping schedules for promoting foundry health and safety; (4) first priorities for health and safety for the new manager of a "backward" foundry; (5) role and conduct of works committees in promoting health and safety, and (6) how to make safe workers out of apprentices and young people. In the case of groups (2) and (3), the membership turned out to be so large that sub-division was arranged. In general, the president said in introducing the reports, the sessions had been very successful and the deliberations most fruitful.

(1) *Noise Problems*

The findings of this group were reported by Dr. R. N. Wilson who said that a purely practical approach had been made. The problems seemed to be similar to those of dust in foundries; they could be split up into (*a*) the physics of noise—best left to experts; (*b*) the testing of noise—again, a matter for experts; (*c*) examination of employees for hearing defects (experts were needed here also); (*d*) the variable susceptibility of human beings to noise as a hazard; (*e*) could any "safe" level be put forward? (70 to 95 decibels was quoted as a possible "yardstick" here); (*f*) were moderate concentrations of noise harmful over a long period or were high intensities for short periods more dangerous? On the physical aspects, the general opinion of the group seemed to be that it was noise which could be heard, *i.e.*, vibrations in the audio-frequency range which were likely to be the most damaging. Also to be considered, however, was the nuisance level of factory noise in relation to nearby residents and safety aspects, where noise obstructed verbal communication or warning signals.

In foundries, the worst noises—in order of degree—were reported as those from jolt-type moulding machines, knocking-out, grinding, barrelling of castings and miscellaneous causes. For curing these, segregation of operations was the optimum measure—a difficulty being the fact that single-roof buildings often served as sounding boxes. Foundry buildings of brickwork were better than sheeted constructions, but even old buildings could be acoustically lined to prevent noise propagation, it was stated.

Machinery

To help to alleviate the problem of noise, the discussion group addressed a series of questions to the makers of foundry machinery. For example, could knock-outs be enclosed in a chamber, and was the pushing out of moulds a less-noisy operation? Could not pneumatic hammers be improved? Floors of wood might be better than those of metal or concrete from a noise-reduction viewpoint, it was thought. Summing up, the *rapporteur* described the human ear as a very fallible method of assessment of noise level and said that data should be collected by experts in the field. When it came down to fundamental knowledge about noise problems, the team had found themselves woefully ignorant of basic data.

(2) *Safety Propaganda*

Two sub-sections of this group were compèred by Mr. L. V. Marshall and Mr. E. Bednall, but their joint findings were reported by the former. He said they had taken their terms of reference to mean they should put forward schemes to propagate a doctrine of safety in the foundry and that everything appertaining to safety within a works came within this orbit, particularly literature, posters, films and other visual aids were very important. (The *rapporteur* had himself made slides of accidents occurring at his own works which could be shown to groups of personnel). Other spheres of activity included T.W.I. (Training Within Industry) courses, competitions, exhibitions, and conferences such as the present one.

Assessment of Results

When assessing the value of safety propaganda, Mr. Marshall reported that lectures and visual aids were valuable and especially so for young people, particularly if followed by visits to the scene of operations. The need for accident prevention must be emphasized to all concerned and everyone's enthusiasm and safety consciousness must be enlisted. Safety should be regarded as a normal part of production. Young people needed to learn that injuries are *caused*—they don't just happen—and faults of persons, unsafe acts and unsafe conditions of working are the real causatory features.

The group suggested that special attention be devoted to three fields: (1) The working area—which might be interpreted the inculcation of good-housekeeping; (2) working-method studies and (3) the operator—was he properly attired and fit for his job? The spectators' responsibility, too, was not to be dismissed lightly. It should be incumbent on all persons to take *action* when they saw the perpetration of faulty methods or activities. Unfortunately, until quite recently RoSPA (Royal Society for the Prevention of Accidents) had had no poster for display as a warning against burn accidents—which were all too prevalent in foundries. However, the slogan competition which had been organized by RoSPA had proved quite successful, it was thought.

Ironfounding Health and Safety

In summation, the group considered the greatest contribution to safety propaganda could be given by individuals themselves—humans were more fallible than machinery—and executive staff inside the foundries should set an example at all times. In its ultimate conception, accident prevention was good business for everybody within an organization.

(3) *Inspection, Maintenance, Cleaning and Housekeeping Schedules*

For this group, two sub-section chairmen reported individually, as the recommendations were not unanimous. Mr. W. F. Trafford for his members said discussion had ranged very widely over the subject and seldom had universal agreement been obtained, but that in itself might be quite a good thing because it showed individual thinking. However, they did agree that written schedules for inspection, maintenance and cleaning should be drawn up for both large and small foundries and used regularly. When considering dust on foundry walls and steelwork, the disturbance caused by vacuum cleaners was criticized, it being thought better to use a broom for walls during a shut-down period—the wielder of the broom wearing a respirator. It was possible also to employ outside contractors for cleaning out of hours; even tiled foundry walls should not be dismissed as a too-far-fetched idea. Other measures, comments and recommendations put forward by Mr. Trafford's section were that maintenance men were congenitally untidy; that in regard to lifting tackle all the responsibility could not be saddled on to inspectors belonging to the insurance company; that thorough damping was an essential preliminary to floor-sweeping (but caution was necessary in relation to floor wetness and metal spillage), and that conveyor-belt maintenance must be of the highest order—the provision of interlocking switchgear on conveyors, it was thought, might be made obligatory. As to the wearing of goggles, the members thought this might be considered in relation to the lighting system of the works and possibilities of glare and reflection. Persuading people to wear goggles was described as "uphill work," but it appeared that ground was being gained. As to the cost of safety, could not large foundries disseminate information they had gained? Why was there no standard manual of reference on foundry safety administration—could the CFA do something here? Possibly, also, the CFA might get the special hazards of foundrywork considered in T.W.I. courses.

Other Views

Mr. A. W. Bushell said his section had split their terms of reference into two—inspection and maintenance, and cleaning and housekeeping. For attending to the first subject, in large foundries a department could be set up, the "life" of a machine or part could be assessed and the unit changed without further inspection at the end of that life. The value of an earth-leakage alarm, wired into the firm's electrical system, was pointed out.

In small foundries, safety inspection and maintenance was usually delegated to one man who did all the thinking—and all the work! It was useful, however, if he could train subsidiary personnel so that more people became safety-conscious. As a general comment, the section thought that foundries lagged behind the engineering industry in matters of routine maintenance. For example, in relation to such plant as cupolas and ladles.

As to cleaning and housekeeping, the feeling was that all progress in this sphere stemmed from enthusiasm on the management's side. In contrast to the other sub-section, the members thought that a study should be made of the introduction of mechanical cleaners to cut out the broom wielders. They also emphasized the value of the "gangway rules" in the Foundry Regulations and mentioned that in one case the raising of gangways by 2 in. above the general floor-level had served well as a measure to keep them clear of obstruction and sand.

(4) *A "New-broom" for a Backward Foundry*

Mr. L. Hearnshaw reporting his group's consideration of what were first priorities in health and safety for the new manager of a backward foundry said to begin with he had got a man-sized job! They recommended he should make a survey of what was needed, followed by the formulation of both short-term and long-term policies. Under the former would come making plant safe and good-housekeeping. This, gradually applied, would probably increase production, give better quality of castings, and lower the accident rate. Still under short-term measures—in descending order of priority—would come first-aid, safety equipment; proper use of materials and processes and amelioration of working conditions.

In the long-term project—again in order of priority—would come the provision of good toilets, lockers and other amenities, at least to the minimum standards of the Regulations. Second, would be attention to dust suppression, with emphasis on good general ventilation. Third, would be the institution of good labour-relations and communications, and fourth, liaison with personnel at other works who were engaged on similar tasks, so as to compare results and stay "on top" of modern safety practices.

(5) *Rôle and Conduct of Works Committees*

On this subject Dr. G. MacBain said he had taken over the *rapporteur's* job but that Mr. L. S. George would give a special contribution. At the outset, he explained that he appeared to have a team of "professionals" among whom he was the amateur. A works committee was not a safety committee and this should be well realized. A works committee ought to be properly constituted—not merely a sub-committee of some other committee. A workmen's representative as chairman or deputy often brought good results. It was vital, too, for efficient working of the committee that

proper rules of conduct and procedure should be drawn up, and there should be freedom of speech, so that all members of the committee could express personal opinions without fear. When preparing minutes of each meeting, it was necessary that the secretary kept to the subject, and it was also of great help if a member of the management or the management's spokesman could be included on the committee. Finally, Dr. MacBain stressed the value of communications, so that motions passed and ideas put forward could be dealt with immediately. Before a meeting was held, a tight agenda was valuable and, as a general rule, there should be no need to include "any other business."

Activities of a Works Safety Organization

The idea of safety inculcation by fellow workers was good, and here Mr. George (describing the system at Park Gate Iron & Steel Company, Limited) said that a works committee to promote health and safety had no duties if the safety officer did his job properly. All foremen at the works were expected to discuss some aspects of safety matters with each man working under him, *e.g.*, when issuing safety equipment or checking safe methods of working, then the general manager would discuss any comments with his foremen over a given period. This should lead to action and, if not, the safety officer would be brought in and high-level consideration would be instituted. The result of this action was that accidents which caused lost time were reduced by 30 per cent. at Mr. George's firm.

(6) *Making Safe Workers out of Apprentices*

Mr. R. H. Buckland began his report of his group's deliberations on how to make safe workers out of apprentices and young people by saying that it was necessary to guard against accident proneness very early in apprentices' careers, and the young men in the shop must be set an example in safety by others working with them. It was also necessary to give the young men pride in knowing how to deal with hazards encountered in their working hours, but one must be careful when discussing these, so as not to make young people afraid. Methods of dealing with foundry hazards would vary with the size of the works, but the basic principles would not change. The group felt it was of value for the foremen to watch the young men and at the same time give them instruction on safety methods. This should be supported by local special courses for apprentices, *e.g.*, those given by the Birmingham Safety Committee, and the group also felt that safety matters should be a part of an apprentices' curriculum. Then Mr. Buckland listed seven observations put forward by his group as follow: (1) During a young man's last year at school, he might be given the general principles of industrial safety; (2) there should be close personal contact between apprentices and management; (3) a safety rule-book should be issued to each apprentice and this should be brought up to date continuously and the young man encouraged to refer to it regularly; (4) the supervisor's safety book (shortly to be published by the CFA) should be of great assistance; (5) posters and other visual aids were good, but these needed frequent changing; (6) there should be more national propaganda for safety, for instance, television could help in this direction, and (7) the group suggested the showing of safety films, such as "Hazard," at boys' clubs or other gatherings. The group felt that the making of safe workers out of apprentices and young people was of maximum importance for the cumulative reduction of accidents.

Noise

Mr. Bonney then summed up the discussion groups and said that the CFA was preparing a code of safe-working practices which should be invaluable in reducing accidents. He then introduced Mr. W. B. Lawrie, M.B.E. (of H.M. Factory Inspectorate), a member of the Joint Standing Committee on Conditions in Iron Foundries and asked him to speak on the subject of noise.

Mr. Lawrie asked for assistance from practical foundrymen and safety personnel in dealing with the problem of noise, *e.g.*, assistance was required in eliminating the use of pneumatic chisels, the incorporation of silencers for portable grinders and the use of rubber tyres on trucks, etc. Much work had been done, he said, to reduce noise from oil-burners and the like. On the question of noise in relation to the jolt moulding machine, it had been found that a rubber strip on the table had worked fairly well. He then requested that any such innovations or ideas for reducing noise should be sent to the CFA Safety Committee or to the Joint Standing Committee.

Dr. J. T. Holliday said it was regrettable that the operators themselves could not be made responsible for lapses on their part to observe safety precautions, but Mr. Lawrie pointed out that it was difficult to prosecute a man if he'd lost an eye. To *eliminate* accidents, one must *illuminate*, another member added. Concluding the reports on the discussion groups, Mr. Bonney stressed the real value of the various reports which had been given and remarked on the enthusiasm engendered, and finally, thanked the *rapporteurs* for their help.

Safe Lifting Gear in Foundries

By Mr. C. H. A. McCaully

The author of this paper is technical director of W. & E. Moore, Limited, chain and lifting-equipment specialists. At the commencement, Mr. McCaully said there were three types of lifting carried out in foundries, *viz.*, the lifting of (1) moulding boxes, (2) castings, and (3) molten metal. Under (1), the lecturer said that the choice of size and position of holes and lugs in the moulding boxes were very important. If the holes were too small the lift would, he feared, be made on the end of the hook. This was bad practice because the strength of a lifting hook diminished with the increase in the opening of the hook, and here, Mr. MacCaully quoted examples of accidents which had happened. The sizes and forms of lugs on mould-

ing boxes should be standardized and welded-on strap-type lugs, for example, were of inherently weak design. When using chain slings, the angle made by the legs should not be more than 45 deg. from the vertical and never more than 60 deg. Care must be taken when lifting at points below the centre of gravity—of an assembly of moulding boxes, for instance—especially when two-leg slinging was being used. Four-leg slings should always be used with the centre of gravity between them. There seemed to be a case for adoption of safety designs of crane hooks though these were seldom seen in foundries; lifting of moulding boxes by their flanges was almost invariably hazardous. Foundrymen were notoriously optimistic in assessing the safe-working-loads of domestic-made tackle and this sort of foolhardiness could lead to increased numbers of accidents. When using endless-sling lifting of castings, the sling was invariably subjected to the cutting action of rough and sharp-edged castings, but a code of practice for this type of operation had been developed and the safe-working-load had been reduced. Overloading also was dangerous and this could be avoided only if the slinger knew the weights to be lifted.

Temperature Deterioration

Next, the lecturer dealt with the heat weakening of tackle, saying that even a temperature of as low as 250 deg. C. weakened the tackle considerably, but at 400 deg. C., creep started, plus the cumulative effect of quite moderate temperature. Wrought-iron chain could deteriorate at 250 deg. C., and some steel chain could be strained even at room temperature, but the effect was more common at 250 deg. C. and upwards. The effect of strain-ageing of chains could be removed by heat-treatment, but it was better to institute stress relief before a chain was put into service. In this connection, steel containing 1.5 per cent. manganese was very good material for making chains and other tackle.

Wire ropes were out of place in foundries for slinging purposes and the British Standard for chain now covered four types of material—wrought iron, mild steel, high-tensile steel and alloy steel. The lecturer dealt with the characteristics of each, ending by saying that wrought-iron chain was going out of use.

Annealing and Testing

Mr. McCaully drew attention at this point to the periodic annealing requirements for lifting gear and said that mild steel was soft and susceptible to abuse and was therefore not so good for use in foundries. High-tensile steel could be employed at smaller sizes for a given load and still provide a better factor of safety. In foundries, it might be best to rate high-tensile steel chains with the safe-working-loads of wrought-iron ones. The former gave better wear-resistance but expert heat-treatment and tempering treatment were necessary. Alloy-steel chains had a more obvious advantage for heavier work and this material was now supplied to a new British Standard. Normalizing of steel chains could be valuable for foundry use. Statutory examinations of lifting chains must be carried out by an independent person and never scrimped.

Next, the lecturer dealt with the degree of wear which was permissible, quoting $\frac{1}{8}$ per 1-in. dia. of link. Nowadays, most people, he said, left the assessment and treatment of chains to experts and there were many fewer failures in service, because of better designs and documentation of safe-working-loads. Mr. McCaully ended by giving hints to buyers of chains.

Accident Prevention in Industry

By Mr. W. H. Harris

The final paper of the Conference was delivered by Mr. W. H. Harris, accident prevention officer of Boots Pure Drug Company, Limited, who spoke on "Accident Prevention in Industry." Mr. Harris first listed eight qualifications which each individual workman must have to be classed as a safe workman. These were: (1) He must know his job (2) he must know something of his fellow workmates; (3) he must be conversant with the rules and regulations that govern his job; (4) he must be able, by personal example and demonstration, to carry out the principles of accident prevention (5) he must be observant; (6) he must have tact; (7) he must be enthusiastic, and (8) he must have imagination.

General Points

Next, the lecturer took each of these eight points and discussed them in more detail. Referring to point (1) he said that anyone who did not know his job was sooner or later bound to fail, but it was not always appreciated that safety and accident prevention were really part of a man's job. It should be remembered that a safe workman was also an efficient workman and an efficient workman was a valuable asset to a firm. Regarding point (2), it was most important that an employee should know something of his fellows, especially if they were part of a team. It was essential to know what training they had had (*i.e.*, if they were beginners), what were their capabilities, or what were their peculiarities. For instance, were they reckless or did they take reasonable precautions. With this knowledge, it was possible then to know what part was to be played to prevent accidents. (3) If accidents were to be prevented, rules and regulations that govern the work must be observed, particularly those relating to safety. Each regulation was designed for guidance and benefit and to prevent accidents. Referring to (4), Mr. Harris said that everyone could play a very important part in accident prevention by their attitude towards the safety side of the work. All employees learnt, more or less, from one another and if one workman was running risks, others might copy him and become negligent and sooner or later accidents would occur.

When dealing with young persons, they should always be taught the safe way of doing a job. This could be done by teaching them the correct way

to use hand tools, by showing them the correct way to lift, by encouraging correct stacking and by teaching them the correct way of wearing protective clothing.

Importance of Alertness

Observation was the fifth important point. Workers should be observant of their own capabilities and limitations, of the needs of their workmates as well as their limitations and capabilities. Dealing with the last three qualifications—tact, imagination and enthusiasm—Mr. Harris said that tact was essential if one hoped to be successful in dealings with workmates, especially in regard to accident prevention. Some personnel in their keenness to get things done had very questionable ideas on what constituted a risk and in some cases did not see any risk in the job at all. Here it required the utmost tact to be able to point out a hazard without hurting their feelings or reducing keenness. Imagination also was a very important factor for the reduction of accidents so that things were not only seen as they were but visualized as they should be. For instance, a greasy floor, an obstacle in the gangway, a faulty electric-switch, a loose handrail—all should conjure up to observers the potential dangers and accidents which might arise because of them.

Mr. Harris said he could not stress enough the fact that accident prevention officers were there to prevent accidents, not to cope with them after they had happened. Enthusiasm for accident prevention must prevail above all other factors. One got disappointed because sometimes it appeared that all one's efforts were not bearing fruit and it was then easy to relax and lose enthusiasm. If this happened, more accidents would occur, so it was essential to stick to the job for in the end it was only enthusiasm for accident prevention that reduced the number of accidents.

Causes of Accidents

Next, Mr. Harris summarized the causes of everyday accidents in factories as follow: (1) Handling of goods; (2) fall of persons; (3) fall of objects; (4) stepping on and striking against objects; (5) use of hand tools; (6) traffic (transport); (7) fires; (8) machinery; (9) untidiness; (10) ladders; (11) lifts and lifting appliances; (12) stacking of materials; (13) safety equipment and clothing; (14) horseplay and skylarking, and (15) electrical accidents.

Hand handling resulted in two types of accidents —injuries to hands and arms due mainly to splinters, punctures by sharp materials and nails, cuts on sharp edges or on iron bands on boxes and bales, and by hands and arms being trapped between goods. Injuries to the back under this same heading were due chiefly to incorrect lifting and a correct stance would obviate this. When lifting, the feet should be a little apart, the back should be straight, the knees bent and it was essential to get a good grip on the article to be lifted. The commonest cause of foot injuries was the dropping of goods on the feet and the motto should be "lift from a stable support into a stable position." If the load was too heavy, help should be obtained. Still under the same heading (1), injuries to body and head were due to the spilling of goods and corrosives that might be carried in unsuitable containers, the piling of loads, taking corners wide, collisions and also through carrying too bulky a load.

When using power handling instead of hand handling, injuries to fingers and hands could be caused when inserting a sling into a block, attaching and detaching slings, fixing dogs on case hooks or lifting goods on to insecure foundations.

Turning to causation (2), Mr. Harris said about half the accidents of persons falling were caused by uneven floors, oil or water on the floor, nails and pieces of wood lying about, unsuitable or bad footwear, sudden clouds of steam, smoke or dust, bad lighting and failure to adapt pace and method of walking to the floor surface.

With the accidents caused by (3) (objects falling), it was surprising that most of the objects dropped were small and light but often caused very serious accidents, and hence there was a need for extreme tidiness. There were four main causes of this type of accident—(*a*) use of tools which slip out of hands, *e.g.*, small spanners, screwdrivers, etc.; (*b*) tools or small parts left lying about on platforms and benches; and (*c*) ill-fixed or worn parts.

With cause 4 (stepping on and striking against objects), a large number of accidents might come under the same heading (3), but accidents were also caused by bad design of machinery or benches owing to projections or square corners, and fixtures being wrongly positioned near gangways, doors and windows.

Passing on to cause (5), Mr. Harris said a great many of the accidents caused by the use of hand tools were due to defective or unsuitable tools, and the remainder were caused by the mis-use of the tools. It was essential to choose the correct tool for the job and when using hand tools, the whole of one's body should be behind the tool.

Traffic accidents, (6), accounted for only about 1½ per cent. of the total number. The main hazards were due to ordinary road vehicles moving about the works, power-driven trucks, railway locomotives, small hand-trucks and cycles.

Fires and explosions, (7), Mr. Harris said were not a major cause of deaths in industry. Monetary losses were often due to a factory being burnt down and a person being unable to carry on his job. Some of the causes of fires, the lecturer said, were electrical installations, spontaneous combustion, inflammable liquids, dust and smoking.

Turning next to point (8) under the heading of machinery, Mr. Harris said that this section accounted for 15 per cent. of industrial accidents and the main causes could be divided into the following: (*a*) Deliberately unfenced machinery, such as high shafting, which gave the impression that it was safe by reason of its position; (*b*) partly unfenced machinery, the impression being that the unfenced side would never be approached; (*c*) removal of a sound guard, damaged guards not being repaired or a guard not replaced after repair;

(*d*) faults of machinery due chiefly to poor design, improper setting, failure to test during regular use, deliberate interference and insufficient maintenance; and (*e*) by inadvertently starting a machine (often by a person other than the one injured). Machine accidents could be reduced by the wearing of neat and tidy clothing, with no loose ends—sleeves should be buttoned at the cuffs or cut off at the elbow, and no rings should be worn on fingers when working machinery.

Untidiness

Untidiness (point (9)) Mr. Harris said was one of the main causes of accidents. Insistence on cleanliness and tidiness was very important and did not receive the attention it should. Plant and floor areas which were dirty and untidy invariably caused a high accident rate. The presence of rubbish, dirt, oil, etc., provided tripping and slipping hazards, but this aspect he felt was relatively unimportant compared with the psychological effect of slovenliness on workpeople. A good motto was "A place for everything and everything in its place."

The main causes of ladder accidents (10) were defects of equipment, improper placing, improper use and inexperienced handling. Lifts and lifting appliances (11) accounted for only a small proportion of industrial accidents, but accidents did occur with power-driven lifting appliances and were often fatal. No person should use a goods lift unless instructed to do so. Injuries caused by the stacking of materials (group 12) were principally due to the falling of goods wrongly stacked and trapping and falling of persons. For most types of goods there was a definite safe method of stacking and this should be observed.

Safety Equipment and Clothing

Referring in more detail to point (13)—safety equipment and clothing—the lecturer dealt with safety equipment first. This covered, he said, goggles, respirators, breathing apparatus, dust masks, safety belts, boots, leggings, gloves, portable screens, etc. Accidents under this heading were mainly due to failure to wear or use such equipment when provided and therefore, in the majority of such cases, there was no excuse for accidents.

When talking of clothing in this connection, Mr. Harris said he was not referring to protective clothing but to ordinary everyday wear. Loose ties, open collars, scarves, etc., were dangerous. Worn soles of boots caused tripping and allowed nails and other sharp-edged objects to enter. Worn heels led to stumbling, fatigue, and general untidiness, and long standing in ill-fitting footwear led to fatigue, which in turn produced accidents.

Turning next to accidents caused by horseplay and skylarking, Mr. Harris said no records could be taken of accidents resulting from these, but fooling about did occur in factories and it was only when a serious accident occurred that this point was realized. Finally, on the last cause of accidents—electricity—some technical causes were defective equipment, incorrect installation, lack of efficient earthing, poor maintenance and overloading. Always, an electrical repair should be carried out by a qualified electrician and it was vital to know the whereabouts of the cut-out switch.

As a conclusion to his paper, Mr. Harris ended by listing the maximum weights which could be lifted safely by men, women, boys and girls—depending on whether the work was continuous or intermittent.

Conclusion

At the end of the Conference, the chairman (Mr. Bonney) thanked the lecturers and all who had had a share in the organization of the proceedings. His own view was that it had served to bring ironfounders up to date on all relevant aspects of health and safety and had given a new and authentic background to work which was still proceeding—particularly in relation to pulmonary disease. At the same time, he said there was no room for complacency and all present when back in their works should put renewed enthusiasm into safety work, which, at the very lowest estimate, could result in an enormous reduction in human pain and suffering. There really was no better ideal which anyone could work towards.

Purchasing Officers' Association Conference

The 1960 Conference of the Purchasing Officers' Association will be held in Scarborough from September 29 to October 1. The opening address will be given by Sir Edward Boyle, M.P., Financial Secretary to the Treasury and a paper "Effect on Purchasing of Amalgamations" by Mr. T. E. G. Baker, purchasing director of Albert E. Reed & Company, Limited, will be of great topical interest.

Sectional meetings will cover the following subjects: "New Plastics Materials and their Potentialities," speaker C. G. Addingley, PH.D., director and chief chemist, British Belting & Asbestos, Limited; "Packaging To-day and Tomorrow," speaker J. Castle, marketing adviser, Bowater Packaging Limited; "Some Practical Examples of Value Analysis," speaker W. I. Shaw, chief buyer and director, Joseph Lucas (Electrical), Limited; "Current Importing Experience," Panel consisting of A. W. A. Dillamore, B.SC., manager purchasing division of the stores department, British Petroleum Company, Limited, D. J. Flunder, general purchasing manager, Dunlop Rubber Company, Limited; and L. G. Wilson, B.ENG., purchasing manager, British Insulated Callender's Cables, Limited; "Trends in Materials Handling," speaker H. A. Dixon, national chairman of the Institute of Materials Handling; "Are Ceramics in Industry Out-dated?" speaker N. F. Astbury, M.A., SC.D., director of research, British Ceramic Research Association; "How Buyers in Small Companies can use Computers," speaker J. W. Wright, M.A., Department of Industrial Administration, Manchester College of Science & Technology, and "Preparation and Use of a Purchasing Manual," speaker N. D. Miles, purchasing manager, Swindon Region, Plessey Company, Limited. The Swinbank Lecture will be given by Mr. F. J. White, a past-president of the Association and group purchasing controller of Pilkington Brothers, Limited.

Purchasing officers who are not members of the Association are invited to ask the secretary, at Wardrobe Court, 146a Queen Victoria Street, London, E.C.4, for full information about the Conference sessions.

Scottish Ironfounders seek B.M.C. Orders

Representatives from light castings firms in Scotland were among more than 300 Scottish industrialists who packed a boardroom in Glasgow on Friday—all of them anxious for a share in the £38 million business for British Motor Corporation—comprising castings, forgings, components and accessories—expected to arise with the new factory at Bathgate. Mr. John Lang, who presided at the meeting, convened by the Scottish Board for Industry, expressed surprise and delight at the response to the invitations. It was obvious there was much interest in B.M.C. plans although there was no official of the B.M.C. in attendance. Mr. Lang reported that the purpose of the meeting was to provide information about the Motor Corporation's requirements and the board promised to keep the firms posted with any further news in that direction. He also said that there were many firms in Scotland who might be in need of financial assistance in order to manufacture components and accessories for the new factory and he assured them that applications would be considered for loans or grants.

Asked when the Bathgate factory would be ready, Mr. Allan Young, Regional Controller for the Board of Trade, said there would be three separate buildings, but the first factory should be ready by early autumn next year. Meantime a great deal of ground preparation had to be done. The capacity of the new factory would be 1,000 trucks and 750 tractors per week. As to when the Corporation would be setting up a buying organization in Scotland, Mr. Young explained that the whole of the commercial-vehicle plant of the Corporation was being transferred to Scotland and added that the firm would no doubt be most anxious to set up a buying office at the earliest possible moment.

Pointing out that the estimated expenditure for accessories and equipment was £38 million, he said that at the outset it was likely that the firms now supplying them in the south would continue to do so for a time. Mr. Young could not say what factories manufacturing components would be prepared to set up plant in Scotland, but he did say there had been a number of enquiries.

The chairman impressed on those assembled that the B.M.C. would only buy in Scotland if the price, quality and other essential factors were comparable to those of sources where they already buy.

Brightside Group's Order-book

Orders secured by the Brightside Group include a number from overseas. Amongst these is a contract placed with the Brightside Foundry & Engineering Company, Limited, Sheffield, for a new 10¼-in. double-duo-mill of five stands with auxiliary machinery for the Koninklijke "Demka" Staalfabrieken N.V., Holland. The company has also secured an order from the Algoma Steel Corporation, Canada, for two heavy-duty roll-turning lathes to deal with mill rolls up to 40 tons each. From the Tata Iron & Steel Company, Limited, of India is an order for a further supply of specialized equipment for their medium section mill at the Jamshedpur works. The reconstruction and modernization of the 12-in. bar mill at Llanelly Steel Company (1907), Limited, South Wales, is also to be carried out by the Brightside firm, which is also to supply an 8-in. five-stand, three-high mill for smaller-size stainless-steel bar production at Firth-Vickers Stainless Steels, Limited, Sheffield.

(*Concluded in adjacent column*)

Company News

BIRMINGHAM SMALL ARMS COMPANY, LIMITED—The controlling interest (51 per cent. of the share capital) in Hobbs Transmission, Limited, has been sold to the minority holders. No terms are revealed.

BIRFIELD, LIMITED—Sales during the nine months ended April 30, 1960 increased by over £4,000,000, compared with the corresponding period last year—from £14,768,000 to £18,845,000. Net trading surplus for the period nearly trebled from £617,000 to £1,801,000.

THE BRITISH OXYGEN COMPANY, LIMITED—Having considered the advantages of bringing about a reduction in the value at which the ordinary stock is quoted on the Stock Exchange, the directors propose to turn the £1 stock into 5s. shares. An extra-ordinary meeting is to be held on July 27.

RENOLD CHAINS, LIMITED, precision chain engineers, of Wythenshawe, Manchester—Group net profits expanded from £495,561 to £926,809, after tax. The final dividend is 8 per cent., as forecast, on capital increased by a 50 per cent. scrip issue, making the equivalent of 10 (8.33) per cent. for the year.

ACROW (ENGINEERS), LIMITED, structural engineers and builders' plant manufacturers, of London, W.2—Share capital of Thos. Storey (Engineers), Limited, has been acquired, and it is intended to redeem the £217,900 secured debenture stock of Storey at par and issue in place a similar amount of 6 per cent. unsecured loan stock, 1976-80, in Acrow.

TUBE INVESTMENTS, LIMITED—In response to the offer for the ordinary share capital of Raleigh Industries, Limited, valid acceptances have been received in respect of 3,866,688 (95.3 per cent.) of the shares. The offer was declared unconditional on June 1 and TI intends to apply the provisions of the 1948 Companies Act to acquire the remaining shares.

STURTEVANT ENGINEERING COMPANY, LIMITED, mechanical and electrical engineers and contractors, of London, E.C.4—An Australian subsidiary has been established, Sturtevant Engineering Works Pty., Limited, which has acquired works at Villawood in the Sydney area. The new company provides manufacturing facilities for Sturtevant Engineering Company (Australasia), Limited, the group's selling organization in Australia. The company has also bought Mancuna Engineering, Limited, air conditioning engineers, etc., of Manchester.

Well-known Foundry to close

Ashmore, Benson, Pease & Company, Limited, announce the closing down of their foundry at Parkfield Works, Stockton-on-Tees, at the end of 1960. In the past, the main products of the foundry were castings for the company's speciality plants. Due to technological changes, such castings now only provide a small proportion of the total load. All employees will receive three months' notice and the run down will begin after that time has expired.

The Brightside Heating & Engineering Company, Limited, includes among its orders one for the equipping with air-conditioning and similar services, of the new twin-operating theatres of the Liverpool Royal Infirmary. Moorwoods, Limited, Sheffield, another Brightside company, is providing kitchens for the new Beachcomber Restaurant at the May Fair Hotel, London. The order comprises a Chinese kitchen, a Polynesian kitchen and a preparation room.

Personal

Mr. G. WALKER, general sales manager of Musgrave & Company, Limited, has been appointed to the board.

Mr. T. H. COOK, B.SC.(ENG.), M.I.E.E., has been appointed chief applications engineer of the Morgan Crucible Company, Limited.

Mr. G. L. F. HUNT has retired from the board of Bristol Industries, Limited, the parent company of the Bristol Foundry Company, Limited.

Dr. T. F. WEST, D.SC., PH.D., F.R.I.C., has been appointed editor of *Chemistry & Industry*, the weekly news organ of the Society of Chemical Industry.

Mr. W. E. DUCKWORTH, M.A. (CANTAB.), A.I.M., has been appointed as head of the metallurgy (general) division of the British Iron and Steel Research Association.

Mr. R. LAROUX HANDLEY and Mr. KENNETH MARSHALL have been reappointed to serve as Joint Iron Council representatives on the Governing Board of the National Foundry College.

Mr. M. A. CLIFTON has joined the sales staff of Union Carbide, Limited, alloys division, as a representative in the southern area. He will be based on the head office at 103, Mount Street, London, W.1.

Presentations have been made to Mr. THOMAS HANNAH, foreman fitter, with Smith & Wellstood, Limited, ironfounders, Bonnybridge, who retired recently after 51 years' service with the company.

Mr. JOHN FREDERIC E. D'ANYERS WILLIS has been appointed chairman of J. & E. Hall, Limited, with effect from October 1. He succeeds Lord DUDLEY GORDON who will retire from the board on September 30.

Mr. J. J. GRACIE, a director of the General Electric Company, Limited, and general manager of its Witton engineering works, is to retire at the end of this year at his own request, after 34 years' service with the company.

Mr. W. BRUNT has retired from the position as general manager of Brockhouse Castings, Limited, Wednesfield, and has been appointed to the board of John Brockhouse & Company, Limited, Victoria Works, Hill Top, West Bromwich.

Mr. OTTO F. REICHWALD has been elected a director of Daniel Adamson & Company, Limited. He will take up the full-time appointment as managing director later in the year. Mr. J. E. ROACH has retired from the managing directorship and from the board of Daniel Adamson & Company.

Mr. B. HEATH, formerly managing director of Powell Duffryn Carbon Products Company, Limited, has been appointed managing director of the Triplex Safety Glass Company, Limited, in succession to Sir GRAHAM CUNNINGHAM, K.B.E., who has retired from that post but will continue as chairman.

Mr. R. MORLEY and Mr. C. CORBETT, two of the British competitors in the recent European Foundry Apprentice Competition, will be spending their holidays in France this year. They will be joining foundry apprentices from other European countries at camps especially organized by the European Committee of Foundry Associations.

Mr. R. R. FYFE SMITH, on his appointment as vice-chairman and resident joint managing director of Smith & Wellstood (Pty.), Limited, Springs, Transvaal, has relinquished his appointment as joint managing director of Smith & Wellstood, Limited. He remains a director of that company, and Mr. R. F. MAXWELL becomes sole managing director.

Mr. W. W. DOLTON has been re-elected president of the British Non-Ferrous Metals Federation for the ensuing year. Mr. M. CLAPHAM, Mr. C. H. M. HOLDEN and Mr. W. F. SLATER have been re-elected vice-presidents; Mr. H. F. SHERBORNE has been elected a vice-president and Mr. W. F. BRAZENER has been elected treasurer in place of Mr. A. L. Johnson who has retired.

Following the acquisition of control of Modern Engineering Developments, Limited, the board of K.G. (Holdings), Limited, has announced that Major-General W. A. LORD, Mr. D. D. MATHIESON and Mr. R. S. UFFINDELL, directors of Modern Engineering, have been appointed directors, and Mr. P. EDGE-PARTINGTON, an alternate director of the company. Mr. S. SCHAFFER has resigned from the board of K.G. (Holdings), and Mr. A. E. STOTT has been appointed secretary.

Turner & Newall, Limited, has announced some changes in the boards of its subsidiaries. Mr. N. A. MORLING, a member of the parent board and chairman of Turner Brothers Asbestos Company, Limited, J. W. Roberts, Limited, and Glass Fabrics, Limited, has been appointed to the board of Ferodo, Limited. Mr. G. S. SUTCLIFFE, a member of the parent board and chairman of Ferodo, has been appointed to the boards of Turner Brothers Asbestos, J. W. Roberts, and Glass Fabrics.

MR. ROBERT WAIT has been appointed director and general manager of Mavor & Coulson Switchgear, Limited. He served his apprenticeship in their Sheffield works and became electrical service-engineer there. He was then representative in Newcastle before becoming chief electrical designer in Glasgow in 1951, and he retains this appointment as well as the new ones. He is an associate member of the Association of Mining Electrical and Mechanical Engineers and was local branch president last year.

For expert demolition of the 100-ft. chimney at Denby Colliery, Derbyshire, Mr. FREDERICK HERAPATH, 66-year-old foreman with M. Macdonald & Co. (Steeplejacks), Limited, of Nottingham, has been awarded the firm's trophy as "Steeplejack of the Year." He felled the 100-ft. colliery chimney with such accuracy that it fell within three inches of the predetermined place. The trophy is a silver weathercock and this is the third time that Mr. Herapath has won it. In June he was awarded the BEM for 45 years' work as a steeplejack. Mr. Herapath is due to retire at the end of the year.

Mr. JAMES S. VANICK, has retired from his position as research metallurgist with the Development and Research Division of the International Nickel Company, Incorporated, of New York, after completing 38 years' service. Mr. Vanick became associated with International Nickel in 1922 and his work has been concentrated on foundry products in iron and non-ferrous alloys. Before joining INCO, he served as research associate at the US Bureau of Standards for the US Navy, and as engineer of tests with the British Ministry of Munitions. Mr. Vanick is a M.Sc. graduate of George Washington University and holds a B.Sc. degree in metallurgical engineering from Case Institute of Technology. He is the author of many metallurgical papers on ordnance materials, corrosion effects and production and properties of foundry products in cast iron, bronzes and other metals, and holds citations for outstanding service to the ferrous-castings industry. He is a past director and past chairman of many American Societies, including sections of the American Foundrymen's Society and the American Society for Testing Materials.

Equipment and Supplies

Drying Oven

Sulzer Bros. in Switzerland have included four oil-heated ovens for drying resin-bonded cores in their new foundry. These ovens have a total maximum capacity of 160 tons, and were furnished by the Electric Resistance Furnace Company, Limited. The four ovens are of identical design and are arranged in two pairs (Fig. 1) for convenience of operation. All have a double steel casing containing glass-fibre insulation to prevent heat losses, and are equipped with charging bogies. These are propelled along rails by a chain drive fitted beneath the hearth, doors at both ends facilitating insertion or removal in opposite directions. The oven chambers are arranged in three independently-heated zones and equipped with an oil-burner and air-circulating-fan for each zone. The temperatures of the zones are controlled separately, to suit a charge and its heating requirements, with electronic oil-burner regulating instruments. Both light and heavy oil can be used for heating. The three fans fitted in each oven provide a high-velocity air-circulation which, it is claimed, speeds the heating of a charge and ensures even temperature distribution throughout the zones (temperature variations in a fully-charged oven can be kept within $\pm$ 3 deg. C.).

The drying process is automatically controlled by a punched-card system. When a charge has been inserted and the programme set, the operator takes no further part in the functional operation of the plant. Once a control cycle has been determined it can be indexed to ensure exact repetition of a drying process which consists of heating, holding at temperature, natural cooling to a selected temperature and forced cooling by the introduction of cold air.

Two of the ovens are of identical size, each taking charges up to 25 tons and having a chamber 16-ft. 5-in. long, 8-ft. 2-in. wide and 8-ft. 2-in. high. The largest of the ovens takes a maximum charge weight of 70 tons, its chamber being 19-ft. 8-in. long, 13-ft. 1-in. wide and 11-ft. 6-in. high. The fourth oven has a chamber 19-ft. 8-in. long 9-ft. 11-in. wide and 8-ft. 2-in. high, and accommodates charges up to 40 tons. The ovens are normally operated at a temperature of 320 deg. C. and a complete drying process takes five hours.

Conveyor Belting

A range of man-made fibre conveyor-belts with safe-working stresses of from 40 lb. per in. per ply up to 200 lb. per in. per ply has been introduced by BTR Industries, Limited, Herga House, Vincent Square, London, S.W.1. The belts, known as Nypac, are nylon wefted and combined with either cotton, rayon or Terylene, according to the tensile strength required. Advantages claimed for the belts are that they have higher safe-working-stress values than conventional cotton belts; they are lighter in weight, have greater flexibility, better troughing characteristics, and higher pull-out strength, and also that they are particularly suitable where acid or chemical contamination is likely. The belts are available in three qualities of rubber cover—4,000 lb., 3,500 lb., and 2,500 lb.

Air-tool Service Case

B. O. Morris, Limited, of Morrisflex Works, Briton Road, Coventry, have produced an air-tool service case measuring 20 by 19 by 9½ in. (all-up weight 35 lb.), which is to cater for the needs of maintenance engineers who need mobility and to tool-room operators who like a self-contained lock-up storage unit. The case contains an air-service unit handling up to 88 cub. ft. per min. at 80 lb. per sq. in., comprising filter and lubricator, together with a pressure gauge, and is fitted with two quick-action couplings to take the two ¾-in. bore 12-ft. lengths of hose that are provided. A hose screwdriver and a useful adjustable spanner are included in the kit, together with a padlock and keys.

Electronics Construction Outfit

Together, Clarke-Smith Manufacturing Company, Limited, and Griffin & George, Limited, Ealing Road, Alperton, have produced the Griffin-Clarke-Smith "Mechtronics" apparatus which enables pupils to assemble for themselves experiments and demonstrations illustrating many of the fundamental principles of electronics. The complete set, type 97-100, contains valves, transistors, a photo-electric device, transformer, relay loudspeaker, circuit board, neon tube, crystal diode and potentiometers, bulbs, holders, switch parts, special connectors, wires, valve holders, resistors and capacitors, etc. The equipment can be used for both qualitative and quantitative work by individual pupils or groups; the qualitative experiments do not require mains supply, but use 4.5 v. and 120 v. batteries.

FIG. 1.—*One of two pairs of EFCO drying ovens in the Sulzer Bros. foundry, Switzerland. The oven on the right takes charges up to 70 tons. The units were supplied by Electric Furnace Company, Limited, through their Basle subsidiary. The bogies run on rails, movement being by a chain drive fitted beneath the hearth.*

Equipment and Supplies

"B" Block

Claimed to be new and revolutionary, a supporting stand for cylindrical components, known as "B" block, made by Rubert & Company, Limited, Acru Works, Demmings Road, Councillor Lane, Cheadle, Cheshire, is said to be the answer to problems arising from the inadequacy of conventional Vee-blocks. The unit consists of a stand (which needs to be accurately machined on the top and bottom faces only) on which the component is supported on four hardened and polished steel balls, positively located on the top surface (Fig. 1). The reduction in machining requirements and the inherent accuracy of commercially manufactured steel balls permit the making of a stand made to an accuracy of ± 0.0001 in. at a modest price. "B" blocks can also be applied, it is stated, to concentricity testing. The "B" block has four balls which are locked together on a flat surface, the balls being precisely self locating by virtue of their own extreme accuracy, thus the component becomes self aligning by providing four contact points on each block.

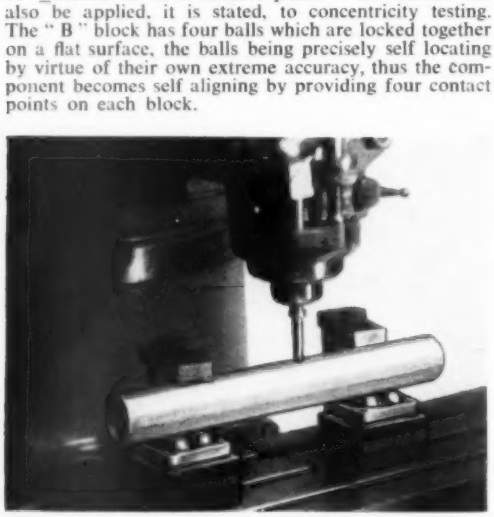


FIG. 1.—*"B" block (Rubert & Company, Limited) in use on a drill stand for locating a cylindrical component.*

In addition to the self-aligning properties, the four-point support minimizes the chances of marking even when the component is being revolved. For use with very soft metals, nylon balls can be fitted in place of steel balls and it is possible for the same pair of blocks to accommodate diameters from $\frac{1}{64}$ up to 10 in. simply by turning the blocks through 90 deg. Accurate support can also be given to flat-sided components. Foundry and patternshop applications would seem to include test-bar location; measuring surface-finish on cylindrical components, and mounting of products for dimensional and concentricity checking.

Welding-and-cutting Outfit

A combined welding and cutting outfit is now being manufactured by British Industrial Gases, Limited, 700, Great Cambridge Road, Enfield, Middlesex (by arrangement with the Harris Calorific Company of Ohio, USA). The welding torch—the Economatic 50-2—is lit in the normal way, the welding flame being obtained by pressing a thumb lever, which, when released again reduces the flame to a minute pilot light. By unscrewing the mixer assembly and replacing it with a cutting head, the blowpipe is converted to a cutting torch. The cutting head—model 36—which is $7\frac{1}{2}$-in. long and weighs 12 oz. complete with nozzle—will cut steel sections up to 3-in. thick. It is claimed that the small size and light weight of the torches makes them particularly useful where operators are obliged to work in confined or cramped positions.

Backstand Grinder

B. O. Morris, Limited, of Coventry, have recently released a new abrasive-band machine which incorporates a dust-extractor unit as a pedestal. The machine, model MA 706, is based on the existing model M.160, and consists of a 1 h.p., 3-phase totally enclosed fan-cooled motor (or $\frac{3}{4}$ h.p., single-phase) driving a 5-ft. abrasive belt, 1 or 2-in. wide, over a jockey pulley and contact wheel. The belt speed is constant at 6,000 surface ft. per min. A set of four rubber contact wheels is provided, and a Shearflex wheel is available for arduous work. Another attachment consists of a spindle for carrying a grinding wheel or wire brush on the left of the contact wheel, and a collet for mounted points or rotary burrs on the right-hand side. The machine is mounted on a dust-extractor, model M.475, which employs a $\frac{3}{4}$ h.p. motor and has a capacity of 475 cub. ft. per min. The dust extractor is complete with hoods and trunking.

Machine-tools: Newage Machine Tools, Limited, 98-100, Croydon Road, London, S.E.20, have been appointed United Kingdom representatives for the Fransson and Brantemo range of thread-cutting machines. Three types of machine for bench or pedestal mounting are available with cast iron or light alloy bodies. Type 2 in. U.V. and type 2 in. M.V. have a capacity from $\frac{1}{4}$-in. to 2-in. pipes; $\frac{3}{8}$-in. to $1\frac{1}{4}$-in. bolts and 12 to 52 mm. threads. Type 4 in. M.V. will take tubes up to 4 in., bolts, 2in., and threads of 52 mm. Electric motors are arranged for operation on 400/440 v., three-phase, 50 cycles supply.

Hydraulic Valves: A new range of solenoid-operated hydraulic valves recently introduced by Smiths Jacking Systems, Witney, Oxon., was shown for the first time at the 1960 Mechanical Handling Exhibition.

Included were ac- and dc-operated valves having fluid flow rates of up to 4 gall. per min. at pressures of 3,000 lb. per sq. in. The model can be provided either "normally open" or "normally closed" as desired; two, three or four ports can be incorporated and the coils themselves can be provided for operation over a wide voltage range.

Die Sprays and Die-machine Lubricants: The Lo-Smoke range, developed in the USA by Aldridge Industrial Oils Inc., are now being made in the UK and marketed by the Foundry & Metallurgical Equipment Company, Limited, Queens Road, Weybridge, Surrey. The range includes die sprays for use in the casting of zinc and aluminium, and plunger lubricants for manual and automatic application.

Rotary Compressor: Belliss & Morcom, Limited, Ledsam Street Works, Birmingham, 16, are now making under licence, the French MPR rotary compressor. This development extends their range of compressors into the smaller sizes. The design and construction of the new unit is inherently simple, yet robust, with the minimum of moving parts.

Book Reviews

Story of a Family Firm—Two Hundred Years of Geo. Salter & Company, Limited, by Mary Bache. Published for private circulation by Geo. Salter & Company, Limited, West Bromwich.

Unlike Coalbrookdale and Carron, Salter's is not, nor ever has been, a predominantly foundry concern. The early beginnings of the firm were based on the manufacture of spring balances and a charming picture is included in this book of a cottage in Bilston where the original business was founded. In the two-hundred-year history of the firm, there is nothing more outstanding than the career of Mr. John Hughes who started at the age of nine and carried on until he was 91 years old, in 1936. Surely a record in continuous employment!

Throughout this story, there are constant references to the sporting activities of the bosses and the men. In the sphere of football, the company provided the original West Bromwich Albion with the bulk of their players, including a few internationals. Once a three-day cricket match was staged between an eleven led by Dr. W. G. Grace and 22 of the works' staff.

Control of the firm has been in the hands of two families related by marriage—the Salter's and the Bache's. Apart from being good sportsmen, the family has taken a great part in local civic and church affairs.

The foundry activities receive but little attention in the book. The reviewer remembers some reference to the Spon Lane foundry but as there is no index, he failed to locate it again. Another fault is that the final chapter should have given some notes on the present size of the company and employment total of the works. Despite these minor faults, the book makes interesting reading and recipients can count themselves fortunate.

V. C. FAULKNER.

Malleable Iron Castings. Published by the Malleable Founders Society, Cleveland, Ohio, and obtainable from the Penton Publishing Company, Limited, 2, Caxton Street, London, S.W.1; price $10 (£3 12s.).

The Malleable Founders Society, in 1944, published a book entitled "American Malleable Iron—A Handbook," which rapidly became recognised as an outstanding reference source in this field and in fact replaced the comprehensive textbook on the same subject, published by H. A. Schwartz in 1922. The fact that it has been found necessary completely to re-write the book published in 1944, is indicative of the astonishing progress made by the malleable-iron industry, not only in research, but in new methods of manufacture.

The book deals mainly, of course, with the blackheart section of the industry and begins with a short but adequate history. Then follows an extremely well documented chapter on the uses of malleable-iron castings, which should whet the appetite of the engineer and designer for this material. The various products available from the American malleable industry are then briefly discussed followed by a very complete list of the various physical properties. The mechanical properties are dealt with very thoroughly and included is a particularly interesting section on impact resistance, the effect of temperature and the use of a drop-weight test or an explosion bulge test, on test-pieces in which the presence of a sharp notch is simulated by the use of a brittle weld material on the surface of the specimen. These and other tests demonstrate that malleable iron is safe to use in conditions of severe frost and is, therefore, superior to steel castings in this respect.

The chapter on pearlitic malleable iron will be especially welcomed in this country where there is a growing interest in this relatively new material. The designer is offered tensile strength of over 50 tons per sq. in. at one end of the range of properties, and over 30 tons per sq. in. accompanied by excellent machineability and ductility at the other end. This material is also compared with other ferrous and non-ferrous materials and from the facts given, only high-strength steel has a higher yield strength. The chapter on design and the way in which the designer can help the foundryman to produce a sound casting at lower cost is of profound significance and should be widely read.

In the manufacture of malleable-iron castings this book rather surprisingly ignores the use of the hot-blast cupola, which is so popular in European foundries.

The next 70 pages are all devoted to various aspects of machining, including several case histories and all users of malleable castings must profit from this section. Finally the metallurgy of malleable cast iron is so adequately dealt with that students will use it as a standard text book for years to come.

To conclude, the reviewer finds this to be the most comprehensive book ever published on the manufacture of blackheart and pearlitic malleable cast iron. The omissions are few, and not worthy of mention, and scattered throughout are examples of the uses and case-histories of malleable castings which will surely stimulate designers and engineers into a further examination of this remarkable material, and so repay the Malleable Founders Society for its tremendous efforts in the production of this book.

H. G. HALL.

Data Sheets on Dust Collectors. Published by the British Steel Castings Research Association, East Bank Road, Sheffield, 2; price 30s. post free.

The collection of dust arising from industrial operations is indeed complicated. A system may take too much warm air from the shop and render working conditions uncomfortable. The dust collected—if dry—can be troublesome for clean removal. The housing of the necessary plant for dust removal and collection takes up valuable manufacturing space and so on. Yet the main problem facing foundry executives is the relationship between the cost of the plant after erection and its efficiency. It is in this field that this book is most useful as it covers 19 well-known makers of dust-extraction equipment and indicates where it is installed and for what duties. The introduction is well worth study as pointers are given as to the cardinal facts to bear in mind. Though primarily written for steelfounders, the contents of the book are equally applicable to the problems encountered in foundries handling either ferrous or non-ferrous metals. Thirty-two types of dust collectors are included in the book and the collection efficiency, pressure drop, and water usage of each type are indicated. In addition, a diagram showing the principle of operations is given in each case.

House Organ

Wiggin Nickel Alloys No. 56. Published by Henry Wiggin and Company, Limited, Thames House, Millbank, London, S.W.1.

This edition includes an article on eddy-current testing, and contrasting uses of nickel and nickel-alloys are also featured. Other articles include the use of Nimonic 80A in valves for the Vanwall racing car, and two marine applications of Monel alloy, in trawlers and runabout pleasure-craft.

Publications Received

Sturtevant Products. Issued as publication No. 2304 by Sturtevant Engineering Company, Limited, Southern House, Cannon Street, London, E.C.4.

This 60-page well-illustrated brochure relies very largely on pictures to make known the large number of industries the firm caters for. In the section of the booklet dealing with the firm's dust-collecting systems, there is an illustration of a side-draught exhaust at a twin vibratory shakeout for the removal of hot dust and fumes, and other equipment which is of interest to the foundry industry is illustrated under the section dealing with scrubbers. The particular example shown is the "Thames" scrubber, which treats a gas volume of 38,000 cub. ft. per min., at a mechanized foundry. Yet these two illustrations showing the company's products applied to the foundry industry do in fact represent a fair proportion, as there are, nowadays, but few industries which do not have ventilation and allied problems—such as those ranging from the removal of sawdust from patternshops, the collecting of coke dust from screens in a steelworks to central dust-collecting installations in factories making small plastic parts machined from extruded material. It is very interesting to have assembled in one book information concerning all the many and varied industries which use Sturtevant plant.

The Older Worker and His Job, by Hilary M. Clay. Issued by the Department of Scientific and Industrial Research, Charles House, 5/11, Regent Street, London, S.W.1; price 1s. 3d.

This booklet certainly makes interesting reading, but it leads nowhere as there can be no standardization of human beings. The number of years a man has lived is no indication of his physical or mental stature. The late Mr. John Hughes who worked 82 years for Geo. Salter & Company, Limited, is a clear example of a case where competence at a job lasted far longer than usual. Yet there are in this book many pointers for detecting premature senility in men and possible actions to be taken when detected. Physical conditions, eyesight and hearing, can, when they are obvious, call for action by management as much in the interests of the man as his mates, and both quantity and quality production. There are several references to foundries in the book which is a condensation of a number of studies which have been undertaken.

British Instruments—Directory and Buyers' Guide, 2nd edition. Published by United Science Press, Limited, Boswell House, 9, Gough Square, Fleet Street, London, E.C.4.

This huge tome, sponsored by the Scientific Instrument Manufacturers Association of Great Britain, contains lists of specifications, consultants, firms in the industry, products, and a four-language glossary of headings appears in the index of products and trade names, together with manufacturers' advertisements. It is a particularly useful type of specialized directory which every purchasing agent will value highly.

Toxic Substances in Factory Atmospheres. Published as new series No. 8 for the Ministry of Labour by H.M. Stationery Office, York House, Kingsway, London, W.C.2, price 1s. net.

This booklet gives the maximum permissible concentrations of a large number of toxic substances as a guide to which the efficiency of control measures should be related. Figures for silica in dust are given and most foundrymen will be acquainted with these, but the foundry industry is currently using a wide range of substances, the toxicity of which is little known. That is a good reason for being forewarned and is a strong reason for buying this new publication.

What a Therm of Gas will do in Industry. Published by the Gas Council, 1 Grosvenor Place, London, S.W.1.

It may not surprise readers to learn that a therm of gas will melt 50 lb. of gunmetal, 45 lb. of aluminium and 650 lb. of lead, but the reviewer would not have thought that it would fry only 56 lb. of fish, but double that weight of chipped potatoes! Interesting figures such as these are given for a number of industries and trades in this publication.

New Catalogues

Die Casting. Vincent Engineering Company, Limited, 9, Woodside Place, Glasgow, C.3, having acquired a manufacturing licence from the Schultz Die Casting Company, Toledo, Ohio, have now issued a brochure covering the 21-in. G. J. Schultz model pressure-die-casting machine. In this is given a specification of the machine; a diagrammatic layout, with which is associated an extensive list of spare parts, and a clearly-worded instruction manual. The booklet, which is spirally bound and well illustrated, will be of real service to the users of this type of machine. It is of interest to note that the machine can also be manually operated.

Rubber Conveyor-belting. In publication No. BA 73, Turner Brothers Asbestos Company, Limited, Rochdale, cover in its 50 well-illustrated and documented pages, a wide range of natural and synthetic-fibre, rubber-covered conveyor belts. This information is supplemented by instructions for installation, operation and maintenance. In publication No. BVP 3, the company gives engineering data on service factors, horsepower ratings, pulleys, and installation and maintenance instructions for their Poly V drives.

Mechanical Handling. J. Collis & Sons, Limited, Regent Square, Gray's Inn Road, London, W.C.1, have issued three new catalogues. Of these No. 334 describes and illustrates the LoadaVeyor, which is a mobile powered conveyor for transporting goods to a higher level—a lorry, for example. Catalogue No. 321 deals with the SlatVeyor, an endless slat conveyor, designed to handle a variety of loads unsuited to belt or roller conveying, and No. 333 covers a wide range of mechanical-handling equipment.

Atomizing Nozzles. A very wide range of nozzles is described and illustrated in a 12-page booklet, issued by Ascog, Limited, 44, Theobalds Road, London, W.C.1. The booklet contains much valuable data on the subject of spraying nozzles, and records the issue of new models and the withdrawal of others that have been superseded.

Unit Dust-collectors. Floodgate Steel Fabricating Company, Limited, 758-786, Kingsbury Road, Erdington, Birmingham, 24, have used a four-page leaflet to illustrate and describe a range of nine sizes of unit dust-collectors. A feature claimed for the plant described is the ease of cleaning and replacing the screens.

News in Brief

THE DIRECTORS of Reichold Chemicals, Limited, announce that contracts have now been exchanged for the purchase of the freehold factory site at Havant.

RECENT VISITORS to the Engineering Centre, Birmingham, have included a party of 35 Russian engineers and members of the United Arab Republic Trade Mission to the UK.

FEDERATED FOUNDRIES, LIMITED, have now added to their appliance range the Sofonomatic boiler No. 3, a thermostatically controlled central-heating boiler with a continuous output of 25,000 B.Th.U. per hr.

WOLF ELECTRIC TOOLS, LIMITED, have arranged to purchase the factory premises of Arrow Electric Switches, Limited, which are contiguous to the Pioneer Works in Hanger Lane, London, W.5, of the Wolf Company.

VALUED AT ABOUT £38,000, all the instruments shown on the stand of Hilger & Watts, Limited, London, N.W.1, at the Moscow Exhibition of British scientific and industrial instruments are to be bought by the Russian concern Mashpriborintorg.

AFTER RECONDITIONING, which included fitting a larger turbo-blower and auxiliary machinery, the No. 1 blast-furnace at the West Hartlepool north works of the South Durham Steel & Iron Company, Limited, has been relit. The furnace produces 5,500 tons of pig-iron a week.

DAVY & UNITED ENGINEERING COMPANY'S sports club held their last sports day on the firm's ground at Myrtle Springs, Gleadless, Sheffield, on Saturday, July 2. Next year they hope to use their new ground adjacent to the works at Prince of Wales Road, Darnall, Sheffield.

AT THE INVITATION of the Government of Western Australia, William Denny & Bros., Limited, Dumbarton, is to send one of its directors to survey shipbuilding and shiprepairing facilities in the State and to discuss with Government representatives possible means of providing increased capacity.

J. FRANKEL (ALUMINIUM), LIMITED, Chandos Court, Caxton Street, Westminster, London, S.W.1, announce that the telephone number of their Walsall works has been changed to Walsall 21261 (10 lines) and they have also been connected to the Telex system—33429 and reply Code Aluminfra WL.

SOVIET-INDONESIAN negotiations started in Moscow on July 1. During the talks agreement was reached on the construction in Indonesia of a single steelworks with an annual capacity of 100,000 tons, instead of the two 50,000-ton plants envisaged in the Soviet-Indonesian protocol of January 3, 1959.

HARLAND & WOLFF, LIMITED, are to build 27 presses, valued at about £1,500,000, for the Ford Motor Company, Limited. They have been ordered from Danley Machine Specialists, Inc., of Chicago and London, for whom Harland & Wolff are sub-contractors. The contract will take two or three years to complete.

A NEW FACTORY in Caernarvonshire, North Wales, is to be built by Ferodo, Limited, brake- and clutch-lining makers, of Chapel-en-le-Frith, (Derbyshire), a member of the Turner & Newall, Limited, group of companies. The firm's South London branch has now moved to new premises at 114/116, Thornton Road, Thornton Heath, Surrey (tel.: THORNTON HEATH 2224).

MR. WILLIAM E. BUSSEY, chief of the office of weights and measures in the US Bureau of Standards, Washington, visited the works of S. Parsons & Company, Limited, makers of weighbridges and weighing machines, Young Street, Bradford, on July 4. The company has recently developed a new division devoted to the design and manufacture of machines for weighing aircraft.

ACCORDING to a report from Trinidad and Tobago, Chaguaramas Terminals, Limited, an associate of Aluminium, Limited, of Canada, which already tranships two million tons of British Guiana bauxite per annum to Europe and North America, has completed arrangements with Union Carbide for the transhipment of 100,000 tons of manganese ore per annum, also from British Guiana.

THE FOURTH E.I.T.I. (International Technical and Industrial Exhibition) will be held in the *Palais des Expositions*, Charleroi, Belgium, from September 15 to 26. A significant change has been made this year by the complete withdrawal of all household and other domestic items; this means that the exhibition will be the only one in Belgium devoted exclusively to specialized industrial and technical products.

UNITED STEEL'S "Queen Victoria" blast-furnace at Appleby Frodingham has beaten the record set up only a month ago by the same company's "Queen Bess" furnace. For the first time a British blast-furnace operating with 100 per cent. sinter burden has produced over 1,000,000 tons of iron. The campaign is continuing and the stack lining, made with MR2 superduty firebricks manufactured by Morgan Refractories, Limited, is in excellent condition.

SHEFFIELD UNIVERSITY METALLURGY DEPARTMENT received, on July 6, delivery of a £17,000 X-ray-scanning microanalyser, only the second of its kind in the country. It is the first of three new instruments being purchased with a £36,000 grant from the Department of Scientific and Industrial Research. The two other machines, expected before the start of the new year in October, are an £11,000 electron microscope, and X-ray equipment (costing £8,000) for fluorescence analysis.

ON JULY 12 the Mayor of Huddersfield (Ald. Norman Day) gave a civic welcome to 20 apprentices and their two leaders who arrived last week from France to spend a fortnight in Huddersfield. The visitors, who are employed at the Renault works in Paris, were met by Mr. D. Swann, secretary of Huddersfield Youth Committee, which is sponsoring the visit. During their stay the apprentices will receive English lessons at Huddersfield College of Technology and visit a steelworks, TV studios in Manchester and other places of interest.

DURING the next few years an intensive search for minerals is to be undertaken in Uganda, reports Barclays Bank D.C.O. It will cost an estimated £216,000, and of this sum an aerial survey alone will take approximately half. The Bank states that £95,000 of this will be provided by the United Nations Special Fund and the balance will come from Uganda. Other investigations are being made by two members of the United Kingdom Atomic Energy Authority who are looking into the beryl deposits in Kigezi and Ankole, in Western Uganda.

ON A SITE AT CWMBRAN recently vacated by Guest, Keen & Nettlefolds (Midlands), Limited, who manufactured railway fastenings there, G.K.N. (Cwmbran), Limited, have taken a section for installing a large malleable-iron foundry (to produce parts for the motor industry. On another part of the site, Garringtons, Limited, of Bromsgrove and Darlaston, Staffordshire, one of the Guest, Keen & Nettlefolds companies, will produce precision-forged components for

News in Brief

the aircraft and automobile industries. They expect to be in operation by the end of the year.

"THE RUNNER" a life-size bronze statue, weighing 6½ cwt., the work of Mr. John Longden, J.P., has been presented by Mr. Edward Longden, M.I.MECH.E., a past-president of the Institute of British Foundrymen, and Mrs. Longden, to the City of Manchester. The statue is erected at the Heaton Hall Track, Heaton Park, Manchester, and will be unveiled on July 15. Mr. John, is the brother of Mr. Edward, and was for many years on the staff of D. & J. Tullis, Limited, of Clydebank. He was author of one of the first papers to be given on acid-resisting high-silicon cast iron.

THE SECOND PHASE of Scotland's £18-million vocational-education building programme will include extensions at Dundee Technical College. This, and a further major extension to the Heriot-Watt College, Edinburgh, and the Scottish College of Commerce, Glasgow, is expected to enable Scotland to play her part in doubling the UK output of technologists by 1970. In this same context, education authorities will also provide facilities for the less-advanced levels of study, particularly in smaller towns. Proposals are already being considered for the development of colleges in Dumfries, Galashiels and Perth.

A PARTY of refractory specialists left Sheffield on July 9 on a visit to Russia. They were led by Professor James White, Dyson Professor of Refractories at Sheffield University, and will be in Russia for a fortnight. While there they will meet members of a Russian delegation which visited England in June. Other members of the party are Dr. W. C. Gilpin (Steetley Company, Limited), Mr. C. K. Gregory (General Refractories Limited), Mr. K. Bertram (Pickford Holland & Company, Limited), Mr. C. H. Stein (J. G. Stein & Company, Limited), and Mr. H. Richardson of the British Ceramics Research Association.

A PROJECT that will make Bloemfontein, jointly with Koedoespoort at Pretoria, after 10 years and an expenditure of nearly £23 million, the biggest railway workshop centre in South Africa, is now entering its final stages. The main mechanical and workshop constructions should be in full operation by mid-1961, but some other aspects of the overall scheme will take until August, 1962. The project is one of the biggest industrial undertakings in the Union. With the doubling of the line to the north, Bloemfontein was so overwhelmed with traffic that it was hard pressed to handle it. Consequently the huge marshalling yard plan was implemented.

THE DIRECTORS of Triplex Foundry, Limited, announce that subject to the successful outcome of negotiations, Eclipse Foundry & Engineering Company (Dudley), Limited, and its subsidiary company, Eclipse Metal Industries, Limited, will shortly be joining the Triplex Foundries group. The Eclipse Companies make castings for the engineering industries in grey iron, aluminium and other non-ferrous metals, including die-castings, in aluminium, mazak, lead and tin alloys. Other activities include general machining, fabrications and assembly. The existing directors, Mr. A. C. Sheldon, M.I.B.F., A.M.I.STRUCT.E., and Mr. J. E. Richards, A.M.I.B.F., will remain directors, thus ensuring continuity of management.

THE PURCHASING OFFICERS ASSOCIATION reports that good support has been received for the "Certificate in Storekeeping" evening classes and examinations which the Association introduced in September last year. Courses have been provided at nearly 50 technical and commercial colleges in the United Kingdom, and over 500 candidates have recently sat the examinations. The courses, designed to improve the efficiency of storekeeping staff and to prepare them for supervisory and administrative duties, will be repeated during the 1960/61 college sessions. Interested organizations may obtain further information from their local technical or commercial college, or from the Association, Wardrove Court, 146a, Queen Victoria Street, London, E.C.4.

AT THE LAUNCHING of the 40,000-ton tanker, Gulf Briton, at Billingham-on-Tees, Mr Charles Clore, chairman of the Furness Shipbuilding Company, Limited, said that British shipbuilding needs help now to maintain continuity of employment. He said the quality of ships produced in Britain was unquestioned, but the builders found themselves frustrated when they were expected to compete with open and hidden subsidies and long-term credit facilities which were made available to foreign shipbuilders by their governments. He said, "The problem is now being examined in this country, but adequate action should be taken now." Mrs. R. A. Butler, wife of the Home Secretary, named the ship, which is the largest ever built on the River Tees.

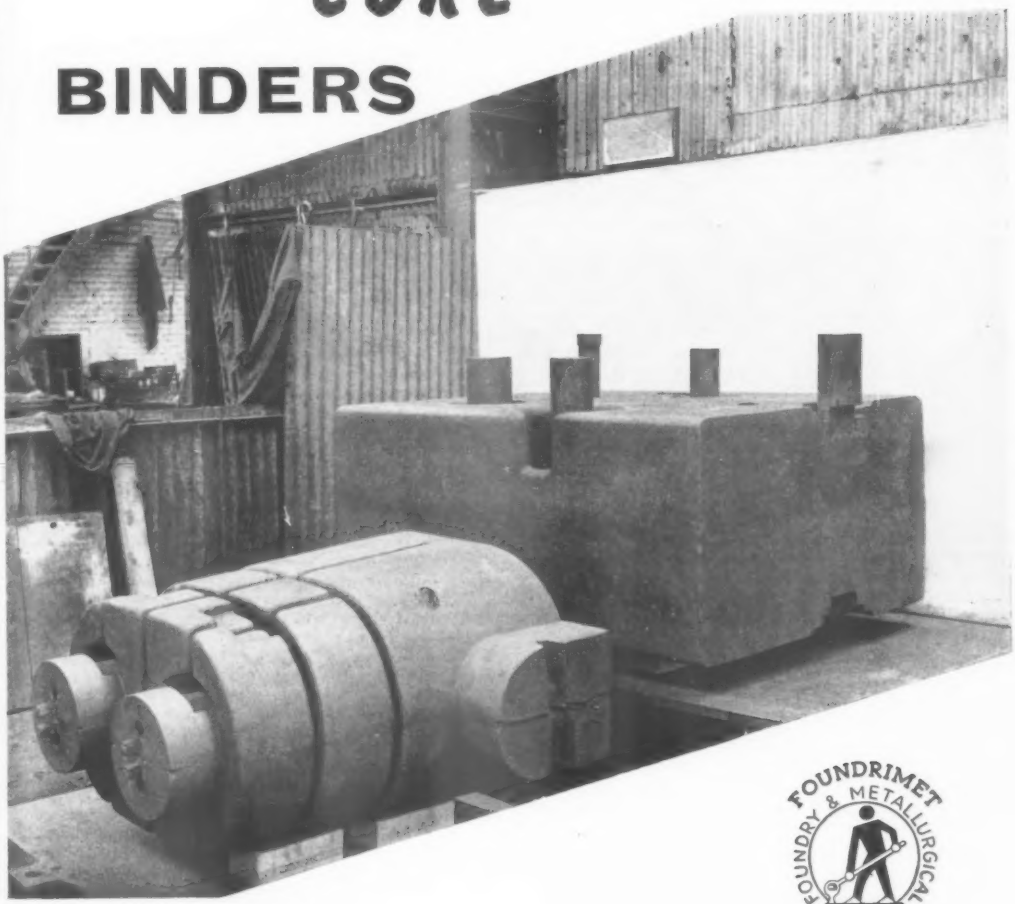
SHEFFIELD AND DISTRICT INDUSTRIAL FIRE BRIGADES' annual competition was held on Saturday, July 9, when 200 firemen took part. Laycock Engineering Company, Limited, with 10 points, won the *Sheffield Telegraph* cup for the best aggregate, with Samuel Fox & Company, Limited, runners-up with nine points. The Samuel Fox team won the two-man hose-drill competition in 14.4 sec., the veterans' two-man hose drill in 17 sec., and the light-trailer-pump drill. Cravens, Limited, won the four-pin hose-drill with driving breaches competition in 11.4 sec. In the works-brigade competition of the Kesteven Fire Brigade contests at Sleaford on July 9, the Aveling-Barford, Limited, works team were first, in 41.2 sec. Second were Blackstone and Company (55 sec.) and third, Ruston & Hornsby, Limited (1 min. 45.4 sec.).

A COBALT-60 ISOTOPE for the gamma-ray examination of steel is a feature of the extensive modernization programme at the Darlington works of Whessoe, Limited, heavy engineers. A special concrete chamber with walls from 2- to 3½-ft. thick has been built in the welding shop by Bovis Limited. The isotope unit, mounted on a hydraulic lift, will be operated from outside the chamber. The isotope, with a strength of 2,000 curies, has been imported from the United States and has a two-ton protective container of phosphor-bronze filled with lead. Work on the installation has been specially speeded up to get the chamber ready for checking steel plates to be used in Britain's first export nuclear power-station. This is being built at Latina in Italy by the Nuclear Power Plant Company, Limited. Within that consortium, Whessoe is responsible for designing and building the reactor pressure-vessels.

Obituary

Mr. CECIL E. WHITAKER a local director of Iessop-Saville, Limited, Sheffield, and formerly with English Steel Corporation, Limited, died suddenly on July 9 at the age of 63. He was awarded the O.B.E. (Military Division) in the last New Year Honours.

SUPINOL CORE BINDERS



Photograph of cores weighing approx. 35 cwts by courtesy of Seagers Ltd. Dartford.

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Raw Material Markets

Iron and Steel

High-duty castings are the major requirement of consumers and enable most of the ironfoundries supplying them to maintain good outputs. Many industries are specifying freely for supplies, and, apart from the collieries and the railways, requirements are at high levels. In many instances only shortage of suitable labour prevents the engineering and speciality foundries from obtaining increased outputs, as they have the orders on hand and adequate supplies of raw materials available to complete them.

There appears to be little, if any, diminution in the call for castings from the motor vehicle trade and the foundries concerned are able to continue their long run of high-level production. Many other establishments also continue to benefit by the continued satisfactory demand for high-quality castings. They can get adequate supplies of the low-phosphorus grades of pig-iron, which is their main requirement, overall production being sufficient to satisfy all demands; in fact, some producers could increase present deliveries if called upon to do so.

Hematite pig-iron is available, and no difficulty is experienced in obtaining supplies of refined iron.

The fall in the demand for light castings from the domestic utensil trade continues and the foundries which supply this market continue to feel the effects of the increased credit restrictions. Outputs at many of these units has declined appreciably, and their mechanized plants are working at much below capacity levels. The light foundries supplying castings to the building trades are employed on better levels by the continued steady demand from that source. Although the jobbing and textile foundries are fairly well employed, they could undertake a much larger flow of orders. The high-phosphorus pig-iron used by these foundries is in good supply.

Non-ferrous Metals

Events in the Belgian Congo continue to dominate the copper market in London. Of definite interest to the market is the news that the present Congo government does not intend to nationalize the mining industry. However, Union Minière du Haut Katanga has announced that it is to transfer its registration from the Congo to Brussels, and that it will set up subsidiaries in the new Republic as soon as this is practicable.

With the deterioration in the political situation copper prices have been kept firm; more than that, Union Minière du Haut Katanga ceased production at the beginning of this week and this has been directly responsible for the sharp rise in the quotation. Why the mine has had to stop production is not clear, but, in any event, the situation in the Congo will influence the market for some weeks ahead and may well offset the natural tendency of prices to ease in the holiday period.

In the US demand is satisfactory but the market is featureless with the price of 33 cents a pound still applicable to both producers and custom smelters. Stocks of refined copper in LME official warehouses rose by 295 tons to 3,375 tons at the end of last week.

Tin is a firm market in London, in Singapore, and in New York, where the price is not far off $1.03 a pound. The situation in the Congo is a sustaining factor in this market, but the point must be made that the price is well over £800 a ton and is being maintained at that level because of good demand. Stocks of tin in LME warehouse rose further last week and now stand at 9,041 tons.

Lead continues a quiet market on both sides of the Atlantic. In the US the market is affected by holidays; while in Canada the reduction in the premium of the Canadian dollar has led to the lowering of the lead price by ¼ cent a pound. The US price is unaltered at 12 cents a pound.

Zinc remains a good market in London and demand continues to be satisfactory. Consumption of zinc outside the US is very satisfactory and it is thought that if demand holds up, the price will go higher once the holiday period is over. In the US the market is quiet with the price unchanged at 13 cents a pound.

Production Engineering Research

A summary of recent activities of the Production Engineering Research Association contains the following information of interest to the foundry industry:—

Machine-tool Slideways

The Association reports that progress has been made in research into friction in machine-tool slideways. It states that following a series of pilot tests on slides under laboratory conditions, a full-scale research programme has been successfully completed on machine-tool slides operating over a wide range of typical conditions. Valuable working data have been obtained on the influence of such factors as types of surface, lubricants, loading, and size effects on machine performance and behaviour. Detailed investigation has revealed a wide field of application for low-frictional materials in machine-tool construction. Information has also been obtained on the conditions under which these materials can be used for special applications.

Research is also providing data which will enable hydrostatic lubrication systems to be applied over a wide field. It is hoped that these investigations will contribute to the development of hydrostatic bearings capable of meeting the exacting demands of automation for low-friction machine-tool elements, precise response to control and minimum wear. A study is also being carried out on systems for protecting slideways from abrasive matter, one of the many problems brought into prominence by the increasing complexity of modern machine-tools.

Technical Investigations

During the past year, the information department's team of technical investigators has been considerably expanded and strengthened in order to provide members with the maximum assistance and improving technical performance. The teams have carried out a large number of critical studies of material utilization, factory layout, mechanical handling, production techniques and equipment, design features which unnecessarily increase manufacturing costs etc. Extensive planned maintenance assignments are also being conducted in individual member-firms by PERA engineers

In one company, four teams of specialists have been carrying out a combined operation embracing work-study, factory layout, handling, foundry practice and machining to assist the firm in implementing a large-scale development programme. The company has reported that considerable economic savings have already been made as a result of this work, which is still in its initial stages.

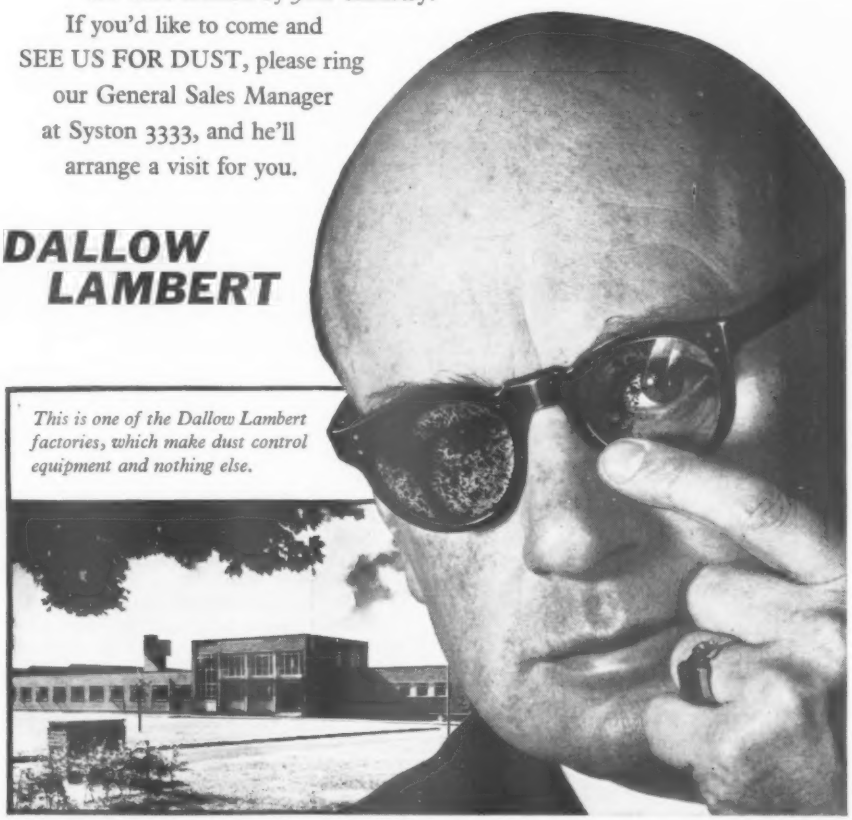
ALUMINIUM CORPORATION, LIMITED—Mr. G. J. S. Boex has retired from the board. Mr. J. Ritchie, Mr. J. Salter, and Mr. P. R. McGhee have been made directors.

an invitation to

see us for dust

If you're interested in dust control,
we're pretty sure you'll find it worthwhile spending
an hour or two with us at Leicester.
There in our demonstration department we can show
you how Dallow Lambert equipment deals with
the dust created by *your* industry.
If you'd like to come and
SEE US FOR DUST, please ring
our General Sales Manager
at Syston 3333, and he'll
arrange a visit for you.

DALLOW LAMBERT



This is one of the Dallow Lambert factories, which make dust control equipment and nothing else.

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CRC 93

Current Prices of Iron, Steel, and Non-ferrous Metals

(*Delivered unless otherwise stated*)

July 13, 1960

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2, 10-ton lots or over: Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.40 per cent. P, 10-ton lots or over, £23 5s. 0d., delivered Birmingham, £23 10s. 0d., delivered Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 6s. 6d.; South Zone, £25 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.; North Zone, £26 6s. 6d.; South Zone, £26 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent., 10-ton lots or over: N.-E. of England (local iron), £23 19s. 0d.; Scotland (Scotch iron), Zone S.1, £24 5s. 6d.; Sheffield, £25 7s. 6d.; Birmingham, £25 14s. 0d.; Wales (Welsh iron), £23 19s. 0d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leicestershire in 10-ton lots or over.

FERRO-ALLOYS

(*Per ton unless otherwise stated, delivered*)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £42 10s. 0d. to £44 10s. 0d., scale 15s. 0d. per unit, lumpy; 75 per cent. Si, £57 15s. 0d. to £61 10s. 0d., scale 15s. 0d. per unit, lumpy.

Ferro-vanadium.—50/60 per cent., 20s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 10d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 12s. 1d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 15s. 1d. per lb. of W.

Ferro-chrome (6-ton lots and over, lumpy).—4/6 per cent. C, £80 10s. 0d. to £84 10s. 0d., basis 60 per cent. Cr. scale 27s. 0d. to 28s. 6d. per unit; over 6 per cent. C, £79 0s. 0d. to £82 10s. 0d., basis 60 per cent. Cr, scale, 27s. 0d. to 28s. 6d. per unit; 2 per cent. C,* 1s. 8d. to 1s. 11d. per lb. Cr; 1 per cent, C,* 1s. 8½d. to 1s. 11½d. per lb. Cr; 0.15 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr; 0.10 per cent C,* 1s. 9¾d. to 2s. 0¾d. per lb. Cr; 0.06 per cent. C,* 1s. 10¾d. to 2s. 1d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £275 0s. 0d.; 9 6/98 per cent., £285 0s. 0d.

Ferro-columbium.—65/67 per cent., Cb + Ta, 19s. 9d. per lb., Cb + Ta.

Ferro-manganese (Standard).—78 per cent., £61 10s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., 100 tons & over, £31 15s. 6d.; tested, 0.08 to 0.33 per cent. C, 6 to 35 tons, £33 15s. 6d.; hard (0.41 to 0.60 per cent. C), under 10 tons, £34 17s. 0d.; silico-manganese, under 10 tons, £43 16s. 6d.; free-cutting, under 10 tons, £36 14s. 6d. SIEMENS MARTIN ACID (under 10 tons): Up to 0.25 per cent. C. £41 1s. 0d.; silico-manganese, £44 4s. 0d.

Billets, Blooms, and Slabs for Forging and for Stamping (under 10 tons).—Basic, soft, up to 0.33 per cent. C, £38 10s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid, up to 0.25 per cent. C, £43 4s. 0d.

* Average 68-70 per cent.

FINISHED STEEL

Heavy Plates and Sections (1 ton to 10 tons).—Ship plate (N.-E. Coast), £41 12s. 0d.; boiler plates (N.-E. Coast £44 2s. 0d.; floor plates (N.-E. Coast), £43 10s. 0d. angles (N.-E. Coast), £38 16s. 6d.; joists (N.-E. Coast) £38 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, 50 tons and over, £39 1s. 0d.; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, 100 tons and over, £38 0s. 0d.; uncoated strip mill coils, hot rolled, under 3 mm. to 12g., 25 tons to under 50 tons, £43 16s. 0d.; black sheets (hand mill), 24g., 10 tons and over. £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £68 5s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £67 17s. 0d.; nickel-chrome, £98 11s. 0d.; nickel-chrome-molybdenum £111 4s. 0d., in lots of 5 tons to under 10 tons.

NON-FERROUS METALS

Copper.—Cash, £259 0s. 0d. to £259 10s. 0d.; three months, £251 10s. 0d. to £251 15s. 0d.; settlement, £259 10s. 0d.

Copper, Tubes, etc.—Solid-drawn tubes, 2s. 5¾d. per lb.; rods, 27ls. 6d. per cwt. basis; 20 s.w.g., 306s. 6d. per cwt.

Tin.—Cash, £808 10s. 0d. to £809 0s. 0d.; three months, £802 0s. 0d. to £803 0s. 0d.; settlement, £809 0s. 0d.

Lead (Refined Pig).—First half July, £70 15s. 0d. to £71 0s. 0d.; first half October, £71 15s. 0d. to £72 0s. 0d.

Zinc.—First half July, £90 10s. 0d. to £90 12s. 6d.; first half October, £90 5s. 0d. to £90 7s. 6d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £126 10s. 0d.; rolled zinc (boiler plates), all English destinations, £124 5s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £105 0s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 2s. 0¾d. per lb.; sheets to 10 w.g., 219s. 0d. per cwt.; wire, 2s. 10d.; rolled metal, 219s. 0d. per cwt.

Brass (Brazing).—BS1400, B3, £179; B6, £229.

Brass (High Tensile).—BS1400, HTB1, £204; HTB2, £225; HTB3, £238.

Gunmetal.—BS1400, LG2, £230; LG3, £240; G1, 1%, £293; G1, 1%, £280.

Phosphor Bronze.—BS1400, PB1 (AID released), £321; BS1400, 90/10/1, £303.

Leaded Phosphor Bronze.—BS1400, LPB1, £248.

Phosphor Bronze Strip, etc.—Strip, 311s. 9d. per cwt.; wire, 4s. 3¾d. per lb.; rods, 3s. 6¼d.; tubes, 3s. 6¼d.; chill cast bars, solids 3s. 6d.; cored 3s. 7d. (CHARLES CLIFFORD, LIMITED).

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 4s. 0¼d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 5¼d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 4¼d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 2½d. to 2s. 3d. per lb; Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £70 0s. 0d. to £70 10s. 0d. Nickel, £600 0s. 0d. Aluminium, ingots, £186 0s. 0d.; aluminium bronze (BS1400), AB1, £264, AB2, £273.

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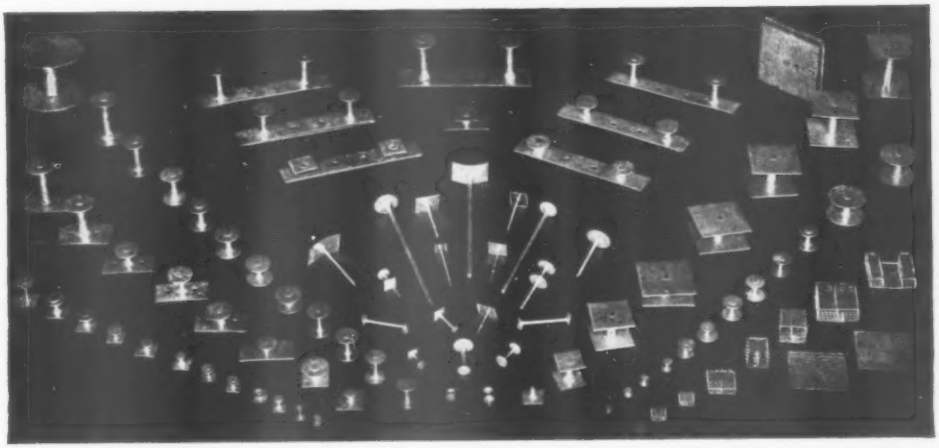

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Imports and Exports of Iron and Steel in May

The following tables, based on Board of Trade returns, give figures of imports and exports of iron and steel in May this year. Totals for the first five months of this year and last are also included.

Total Exports of Iron and Steel

Destination.	Month ended May 31.	Five months ended May 31.	
	1960.	1959.	1960.
	Tons.	Tons.	Tons.
Cyprus	169	735	749
Sierra Leone	169	2,875	2,048
Ghana	519	13,395	8,318
Nigeria	2,593	31,436	25,235
Union of South Africa	5,566	20,750	30,646
Rhodesia and Nyasaland	2,090	9,078	9,240
Tanganyika	2,054	8,108	5,005
Kenya	4,128	10,087	11,301
Uganda	62	2,626	610
Mauritius	442	584	1,867
Aden	306	1,195	943
Bahrein, Qatar, and Trucial States	1,478	3,554	7,556
Kuwait	1,143	6,113	3,121
India	12,522	76,147	102,439
Pakistan	4,505	14,540	30,122
Singapore	2,488	9,894	8,111
Malaya	1,582	5,077	8,297
Ceylon	9,148	21,434	26,042
British North Borneo	701	1,318	2,178
Hongkong	6,388	28,995	29,349
Australia	14,816	37,531	71,608
New Zealand	10,196	38,715	41,761
Canada	28,438	62,266	106,734
Jamaica	1,742	8,323	11,152
Trinidad	2,787	17,060	19,493
British Guiana	1,043	2,687	3,735
Other Commonwealth countries	3,024	17,272	16,485
Eire	5,902	19,589	26,464
Soviet Union	3,842	1,381	13,458
Finland	3,876	12,590	18,601
Sweden	14,663	51,432	86,814
Norway	11,339	39,291	56,349
Denmark	8,687	39,289	45,192
Western Germany	9,249	49,231	70,465
Netherlands	9,369	34,688	56,235
Belgium	4,206	12,915	16,743
France	274	993	2,979
Switzerland	1,199	3,336	5,458
Portugal	1,434	7,180	6,723
Spain	4,761	11,443	20,475
Italy	4,284	23,463	19,091
Austria	455	1,362	2,255
Yugoslavia	4,305	1,618	20,673
Greece	1,180	5,139	7,494
Turkey	3,402	2,266	5,048
Netherlands Antilles	319	1,453	2,094
Portuguese East Africa	217	633	1,774
Egypt	172	1,200	6,464
Sudan	639	4,149	4,699
Lebanon	117	160	593
Israel	1,401	4,405	9,206
Saudi Arabia	17	2,435	196
Iraq	1,819	45,910	10,485
Iran	3,957	12,179	31,604
Burma	899	3,133	3,848
Thailand	272	3,740	3,046
Indonesia	2,518	2,416	14,179
China	4,907	24,479	26,046
Japan	4,878	37,660	35,100
Philippine Republic	327	1,825	4,534
USA	28,002	54,528	132,248
Cuba	1,235	3,289	5,121
Colombia	377	980	3,643
Venezuela	2,900	35,639	21,239
Ecuador	621	482	1,519
Peru	675	1,243	3,198
Chile	370	698	1,274
Brazil	1,280	7,056	8,460
Uruguay	1,252	664	4,670
Argentina	5,230	82,790	43,524
Other foreign countries	7,091	21,871	53,983
TOTAL	284,018	1,124,018	1,497,409

Total Imports of Iron and Steel

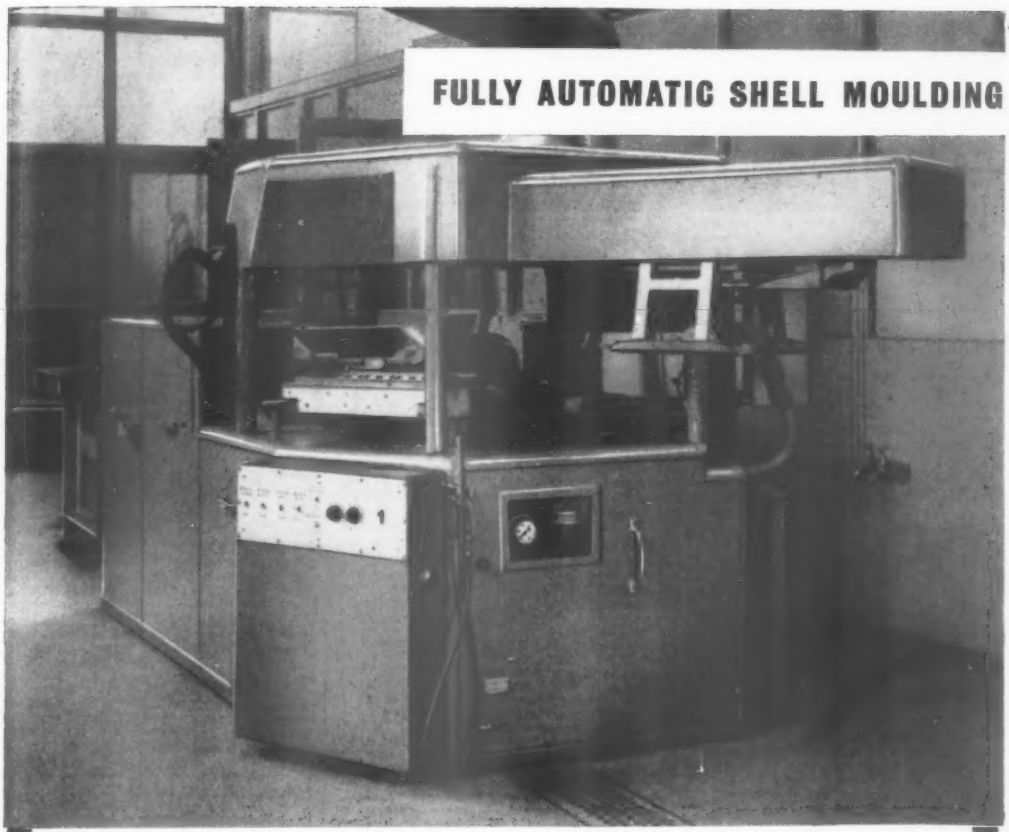
From	Month ended May 31.	Five months ended May 31.	
	1960.	1959.	1960.
	Tons.	Tons.	Tons.
Union of South Africa	1,343	9,294	16,050
Rhodesia and Nyasaland	459	2,108	3,028
Canada	16,658	5,677	27,872
Other Commonwealth countries and Eire	930	4,018	11,475
Soviet Union	496	13,986	14,027
Sweden	4,574	10,575	20,026
Norway	16,056	32,493	62,628
Poland	454	2,428	7,563
Western Germany	11,548	22,664	68,680
Netherlands	24,513	71,028	92,894
Belgium	14,599	11,833	49,758
Luxembourg	1,794	3,371	6,756
France	5,093	8,643	29,256
Italy	5,413	1,687	13,734
Austria	996	1,138	5,479
Japan	369	1,063	3,137
USA	34,978	13,254	88,766
Other foreign countries	21,659	5,033	30,410
TOTAL	161,932	220,293	551,539
Iron and steel scrap and waste, fit only for the recovery of metal	10,297	1,800	66,484

Exports of Iron and Steel, by Product

Product.	Month ended May 31.	Five months ended May 31.	
	1960.	1959.	1960.
	Tons.	Tons.	Tons.
Pig-iron	9,673	55,822	83,953
Ferro-columbium (niobium)	3	22	60
Ferro-tungsten	61	542	467
Other ferro-alloys	1,905	1,718	5,241
Ingots, blooms, billets, slabs, sheet bars (incl. tinplate bars), and similar primary forms	372	27,900	19,571
Pieces roughly shaped by forging	107	738	741
Iron bars, rods, angles, shapes, and sections	90	526	642
Steel bars, rods, angles, sections, and shapes	57,281	136,130	274,553
Iron plates and sheets	104	173	409
Universal plates	1,700	3,126	9,497
Steel plate, 3mm. and under 4.5mm. thickness	2,529	20,061	16,540
Ditto, 4.5mm. or more in thickness	29,720	62,943	149,495
Blacksheets and blackplate	24,399	110,502	132,522
Hoop and strip	7,932	31,161	41,770
Tinplate	40,021	192,361	239,574
Decorated tinplate	413	3,980	2,024
Galvanized sheets	8,871	39,236	47,295
Other (incl. tinned sheets, terneplate, and ternesheets)	3,149	7,278	13,469
Railway and tramway construction material	16,956	72,519	58,824
Wire rods of steel (incl. alloy steel)	4,725	20,075	26,038
Wire	12,153	43,520	55,135
Tubes, pipes, and fittings	65,003	293,685	333,118
TOTAL	284,018	1,124,018	1,497,409

CENTENARY OF the Fairfield Shipbuilding & Engineering Company, Limited, Glasgow, was celebrated on June 30.

ELECTRIC-ARC FURNACE, with a fabric gas-cleaning plant, is to be installed at the Stockton-on-Tees steel-foundry of Head Wrightson & Company, Limited, to replace the existing cupolas and converters.



Production rate 75 shells per hour

The new Baker Perkins Shell Moulding Machine is fully automatic in its operation. The sand/resin mixture supplied to the storage hopper is automatically fed to the machine. The finished shells are automatically removed from the ejection station, and from there if required to a suitable conveyor.

Short runs are entirely practicable, pattern changing being simple and quick, taking only five minutes and effected single-handed.

On production, shells 18" x 12" weighing 4 to 4½ lbs. are produced at the rate of 75 per hour maximum.

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PREPAID RATES: Fifteen words for 7/6 (minimum charge) and 4d. per word thereafter. Box Numbers 2/6 extra per insertion (including postage of replies). Situations wanted 2d. per word throughout.

Advertisements (accompanied by a remittance) and replies to Box Numbers should be addressed to the Advertisement Manager, Foundry Trade Journal, John Adam House 17/19, John Adam Street, Adelphi, London, W.C.2. If received by first post Monday advertisements can normally be accommodated in the following Thursday's issue.

SITUATIONS WANTED

FOUNDRY MANAGER / SUPERINTENDENT desires change. Mall. and grey, practical and technical. Take full control foundry. Rate fixing, etc. Wolverhampton area. Box FM740, FOUNDRY TRADE JOURNAL.

TECHNICAL REPRESENTATIVE (46) requires position with Iron and/or Steel Foundry. Connections in Lancashire and Yorkshire and N. England (grey and special cast irons, carbon and alloy steels.) Considerable technical, administrative and sales experience. Box TR732, FOUNDRY TRADE JOURNAL.

POSITION as Sales Manager or Representative required. Fifteen years' successful management Bronze and Aluminium Foundry in the Midlands. Experienced machine and shell moulding. Box PO728, FOUNDRY TRADE JOURNAL.

REPRESENTATIVE with foundry experience wishes to represent a foundry for non-ferrous and cast iron in London and Counties. Geed personal connection. Commission and part expenses. Box RE726, FOUNDRY TRADE JOURNAL.

TECHNICAL REPRESENTATIVE, age 33, connections in the south, seeks position with reputable foundry. Box TR714, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

FOUNDRY MANAGER required for Grey Iron Jobbing Foundry in North Manchester area. Weekly production 5 tons. Practical man with experience of plate and loose pattern work, sand and metal control essential. State age and experience. Box FM700, FOUNDRY TRADE JOURNAL.

RADIOLOGIST required to take charge of X-Ray and Gamma Ray Department attached to Investment Foundry at Redditch. A.I.D. approval a necessity for ferrous alloys, and preferably for light alloys and brass. Write, giving details of age, experience and salary required, to Box RA734, FOUNDRY TRADE JOURNAL.

CHIEF FOUNDRY METHODS ENGINEER

required by The North British Steel Foundry Limited, BATHGATE, Scotland. The Company operates a modern steel foundry producing castings up to 10 tons in weight. The position calls for a man having a wide experience in the application of modern steel foundry techniques and in the running of a Methods Department. A salary commensurate with experience will be paid, and assistance with housing will be considered. There is a Pension Scheme in operation.

Applications, in writing, should give details of experience, age, education, etc.

The Secretary,
The North British Steel Foundry Limited,
Balbardie Steel Works,
Bathgate, Scotland.

SITUATIONS VACANT—*contd.*

ASSISTANT FOUNDRY FOREMAN, age 28-35, required for large foundry on Merseyside. Sound technical background essential plus ability to supervise labour and organise production. Staff appointment, pension scheme, good opening for progressive man. Apply with full particulars and salary expected to GENERAL MANAGER, c/o Box AF720, FOUNDRY TRADE JOURNAL.

ASSISTANT required for the Foundry Manager of small grey iron Foundry in East Midlands Area making Machine Tool castings up to 3 tons each in weight. Applicant should have experience in Sand Control, Melting Practice (BS. 1452 Grades 14, 17 and 20), casting inspection and quality control and some knowledge of rate fixing, etc. The position offers an excellent opportunity to a keen young foundry technician. Send full particulars of experience, etc., to Box AR739, FOUNDRY TRADE JOURNAL.

CASTER required for pouring brass and gunmetal. Top wages and bonus. House provided for suitable man. Midlands area. Box CR707, FOUNDRY TRADE JOURNAL.

CHIEF PLANNING ENGINEER required for Investment Foundry at Redditch. He will be responsible for design and manufacture of dies and tools as used in the "lost wax" process. Components vary from turbine blades to general commercial work. Drawing Office and Toolroom experience necessary. H.N.C. an advantage. Preference given to applicants with experience in die design for Investment Foundry or Diecasting applications. Full details of experience and positions held should be sent and all applications should indicate salary required. Box CP719, FOUNDRY TRADE JOURNAL.

REQUIRED for India: Non-ferrous foundry TECHNICIAN, about 30 years of age. Must have experience in copper base alloys in Sand, and die casting with metallurgical background. Also must have minimum two years' experience in a managerial position in modern Foundry and conversant with modern practices. Attractive salary and excellent prospects for further advancement. First class passages paid—generous leave terms. Reply: Box RE718, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*contd.*

FOUNDRY METALLURGIST required for Ferrous Foundry (mechanised) situated in East Anglia. Cupola control essential and must have practical experience in sand control. Send details of experience, age and salary, to Box FM733, FOUNDRY TRADE JOURNAL.

WORKING CHARGEHAND required for Non-ferrous Foundry in the south of England. This position is permanent and progressive for the right man, and arises as the result of promotion inside our organisation. Write stating age and experience to FOUNDRY MANAGER, Box WC712, FOUNDRY TRADE JOURNAL.

WORKS MANAGER required for large Midland non-ferrous foundry. Excellent position for experienced technician with copper base castings and aluminium sand and die. Box WM737, FOUNDRY TRADE JOURNAL.

REQUIRED for London Works, S.E.1, non-ferrous metals, FURNACE BRICKLAYER. Staff position. Box RF735, FOUNDRY TRADE JOURNAL.

WANTED.—FOUNDRYMAN, age around 35 years. Strict disciplinarian to take charge of small grey iron and malleable foundries in Walsall area. Fully experienced in progresing work through foundries for machine and stump moulding. Able to fix piece work prices in foundries and coreshop. State full details of experience and present salary. Box WF736, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER for Iron and Non-ferrous Jobbing Foundry, Birmingham Area, with capacity up to 30 tons per week.

Applicant should be between the ages of 35 and 45 and should have had previous experience in management relating to supervision of labour, ratefixing, estimating, quality control, development of modern methods, production and cost control, for which he will be responsible.

Preference will be given to applicant with working experience of the district.

Salary according to experience. The Company operates an attractive contributory Pension Scheme. Assistance with house purchase if required. Box FM696, FOUNDRY TRADE JOURNAL.

BRASS FOUNDRY FOREMAN

Required for Non-ferrous Foundry in Birmingham. Applicant must have practical and Supervisory experience in semi-mechanised production. Excellent prospects for suitable applicant.

Write giving full details to :—
PERSONNEL MANAGER,
BOX No. BF 693.
Foundry Trade Journal

SITUATIONS VACANT—*contd.*

IRON FOUNDRY TECHNICIAN required for six months in small Foundry, important town North Spain. INDUSTRIAL ALONSO, Apartado 336, Gijón (España).

PATTERN MAKER / METHODS ENGINEER required to take charge of design of all core-box equipment (metal and wood) for large mechanised coreshop in the Midlands area. Most interesting work in non-foundry conditions. Attractive salary will be offered to the right man. Write giving full particulars to Box PM731, FOUNDRY TRADE JOURNAL.

ASSISTANT to the Managing Director for small Jobbing Foundry in the Thames Valley area. The applicant should have a sound technical knowledge of iron and non-ferrous casting, and a considerable knowledge of the handling and organisation of labour. The post offers excellent prospects for a keen and energetic man not afraid of hard work Box AT741, FOUNDRY TRADE JOURNAL.

MERSEYSIDE FOUNDRY producing grey iron and non-ferrous castings seeks SELLING AGENTS in Lancashire, Cheshire and Midlands. Capacity ranges from small repetitive castings up to 5 tons in grey iron. Apply Box Z.227, LEE & NIGHTINGALE, Liverpool.

METHODS ENGINEER

THE National Coal Board invite applications for the post of Methods Engineer for their Foundry at Tredomen Engineering Works, Ystrad Mynach, Nr. Caerphilly, Glam. Experience in modern/heavy foundry practice is essential and an approved apprenticeship is desirable. Salary scale: £600 × £25—£900 per annum. Please quote S.V.296/13C. Application forms from the DIVISIONAL CHIEF STAFF OFFICER, National Coal Board, Cambrian Buildings, Mount Stuart Square, Cardiff, to be returned by 28th July, 1960.

FOUNDRY TECHNICIAN required, age 26-35. Should have basic training and good technical education including laboratory experience. Experience in copper based alloys essential and the ability to undertake investigations and initiate original development work in the foundry a principal requirement. Salary range £1,000 to £1,200 p.a. Write stating age, qualifications and experience to GENERAL MANAGER, c/o Box TF721, FOUNDRY TRADE JOURNAL.

FOUNDRIES FOR SALE

FREEHOLD compact Foundry available in East Midlands for sale. REASONABLE OFFERS for IMMEDIATE SALE considered. Write Box FC724, FOUNDRY TRADE JOURNAL.

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WANTED.—Sand Mill in good condition, pan about 4 ft. diameter, suitable for 3 phase, A.C., 400 volt. Box WA676, FOUNDRY TRADE JOURNAL.

URGENTLY WANTED: 6-ton capacity Arc Furnace, preferably swing roof with arc control gear. 3-ton capacity Arc Furnace with arc control gear and transformer. Full details to LAWFORD PLANT AND MACHINERY LTD. Manningtree 365.

SAND MIXERS, 5 to 15-cwt. cap. Sand Mills: 3 ft. 6 in. to 6 ft. dia. Moulding Machines: HPL1 & 2. Core Drying Stove, 6 ft. × 5 ft. × 6 ft. Abrasive Cutting-off M/c., 20 in., 3/50/400 V. Box SM738, FOUNDRY TRADE JOURNAL.

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CONSTRUCTIONAL "Wizard" Barrel Type, size 44 × 40, with Dust Collector.
Tilghman Cabinet, 3 ft. × 3 ft. × 3 ft. 8 in. high, with Dust Arrestor, motorised Fan, etc.
Suitable AIR COMPRESSORS available for use with above if required.

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"Modern Furnaces" 2-chamber re-circ. coke-fired.
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PAN MILLS, 4 ft. and 5 ft. dia. underdriven, stationary pans, self-discharging, new, for delivery from stock. W. & A. E. BREALEY (MACHINERY) LTD., Misterton, nr. Doncaster. Tel.: Misterton 202.

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Adams motorised gear hobbing machine; Power hammers; Alldays & Onions pneumatic hammer; Power hacksaws; Shearing and Punching machine; Motorised horizontal boring machine; Fettling grinder; Motorised horizontal drilling machine; Motorised radial drilling machine; Tool and cutter grinder; Motorised shaping machine; Double disc surface grinder; Motorised 30in. band sawing machine; Petrol-driven foundry sand conditioner; Six ton foundry ladles; Two sets of platform weighing scales; Cummins diesel electric generating plant; Three overhead travelling cranes, viz., 15 ton, 50ft. span, 7 ton, 50ft. span, 2 ton, 50ft. span; Electrical gear including large quantity of 3 phase motors fractional to 15 H.P., Switch gear transformers and starters; Portable electric hand tools; Industrial vacuum cleaners; Metal spraying plant with two compressors; Approx. 10 tons black nuts and bolts in convenient lots; Quantity of new stores including Machine tools, hand tools, vernier and micrometer gauges, Welding rods, etc., etc.

SALE TO COMMENCE AT
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VIEW DAY FRIDAY, 15th JULY,
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SAND MIXERS and DISINTEGRATORS for Foundry and Quarry; capacities from 10 cwts. to 10 tons per hr.—W. & A. E. BREALEY (MACHINERY), LTD., Misterton, nr. Doncaster. Tel.: Misterton 202.

FOR SALE.—Steel Moulding Box Parts Double Lugs 30 × 22 × 11. New. Box SM729, FOUNDRY TRADE JOURNAL.

HACKBRIDGE & HEWITTIC Indoor Type O.I. Transformer, 3/3 phase, 6,600/400 volts, 50 cycles, Delta-Star, 2,000 kVA rating. WHITEFIELD MACHINERY & PLANT, LIMITED, 48, Chatham Street, Edgeley, Stockport. Stockport 4471.

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AIRLESS Rotary Barrel Shot Blast Machine ("Sand Wizard" by Constructional Engineering Co.), size 44 in. × 40 in., complete with elevators, Dust Extraction Plant, etc., arranged for 400/440/3/50 cycles.
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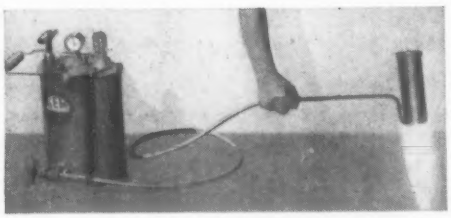

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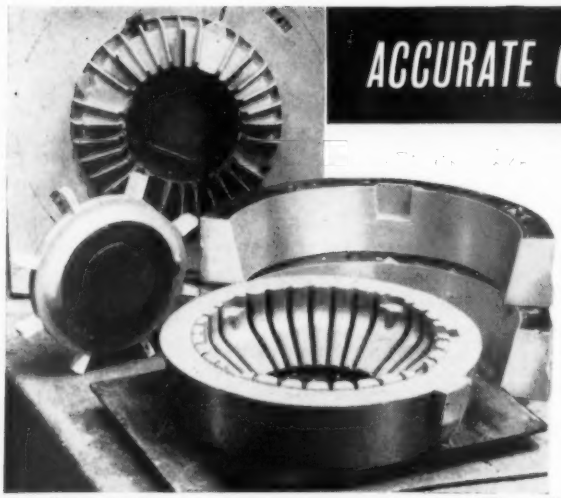

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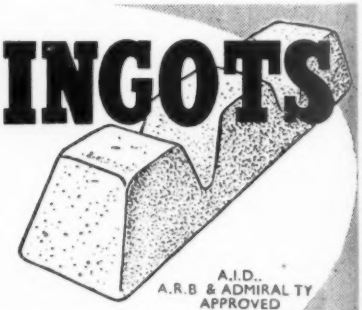

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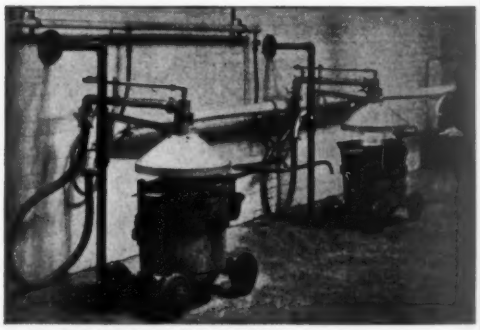

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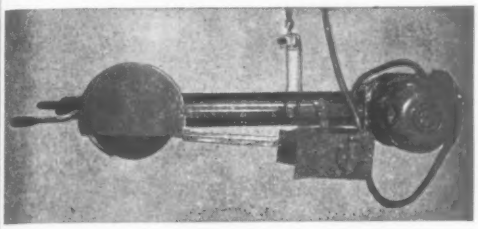

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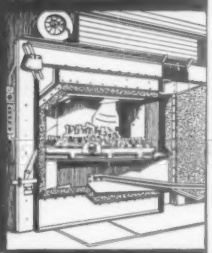

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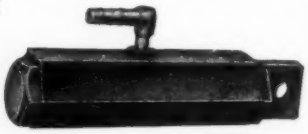

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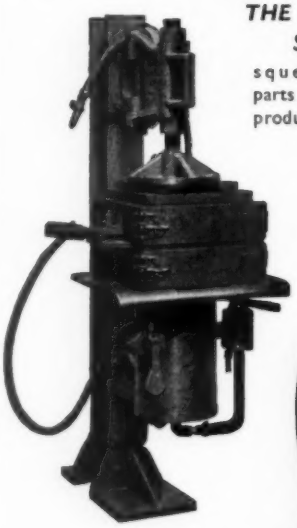

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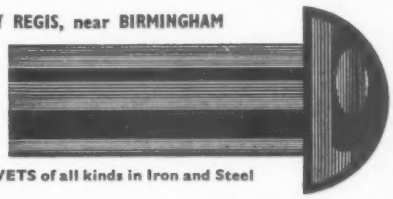

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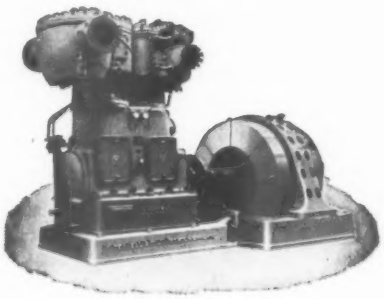

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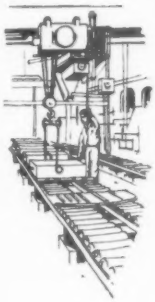

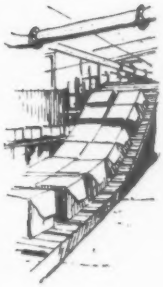

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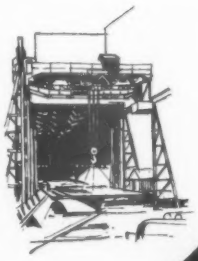

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